

# AVIATION WEEK

A MCGRAW-HILL PUBLICATION

NOV. 10, 1952

50 CENTS

## On the UP and UP!



FROM rescue work and delivering mail, to combat service in Korea and countless uses in business and industry—the Bell Aircraft Model 47 helicopter is one of the rising stars in aviation today.

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once more... "on the nose"

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Flying swiftly from the decks of Navy carriers, McDonnell-Douglas carrier-based jet fighters, the F-15 "Demon" is designed to seek, locate and fire on the enemy. Placed in its prow is another weapon, a rugged ZENITH reinforced plastic construction—the type of product that has brought ZENITH to the forefront in both military and civil R & D production.

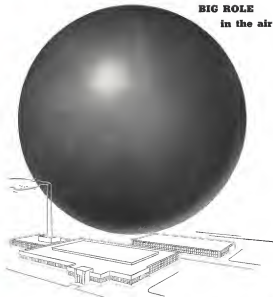
For specific product information, consult the Engineering Division of

ZENITH PLASTICS CO.



10 P.M. is the call to begin the day  
gardena, calif.

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in the air**



The role taken by New Departure Ball Bearings in the aircraft industry is a most important one. Used to reduce friction in applications ranging from transport planes to guided missiles, they play what is perhaps their most vital part when used in aircraft instruments.

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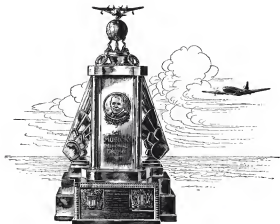
HYBRID ROLLS LIKE A BALL



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BALL BEARINGS**

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MUSICK MEMORIAL TROPHY

"...most effective in furthering the safety of aircraft..."

The Musick Memorial Trophy honors the man who has done the most to advance the safety of aircraft. It is the highest honor in the aviation industry, and it is awarded to the man who has made the most significant contribution to the safety of aircraft. The trophy was established in 1931 by the National Transportation Safety Board, and it has since been awarded to many distinguished aviators.

The trophy was established in 1931 by the National Transportation Safety Board, and it has since been awarded to many distinguished aviators. The trophy was established in 1931 by the National Transportation Safety Board, and it has since been awarded to many distinguished aviators.

For its contribution to furthering the safety of transoceanic aircraft, the Sperry Gyroscope Company has recently won the Musick Memorial Trophy for 1951. This award was made to John E. Lindberg, Jr. and James W. Wheeler who jointly developed the Analyzer. At the time of this development, Lindberg was a staff engineer in the Pacific-Alaska Division of Pan American World Airways and Wheeler was head of the engine instruments department

of the Sperry Gyroscope Company.

Accorded for its contributions to flight safety, the Analyzer is a wide use on commercial and military planes throughout the world. It immediately detects, locates and identifies detailed position and mechanical troubles in aircraft power plants either during flight or on the ground.

Sperry Gyroscope Company  
Division of The Sperry Corporation  
Great Neck, New York

## Domestic

Wright Aeronautical division of the Cessna-Wright Corp. has ordered a large order for Wright R-65 (Supercat) turbojet engines for a new Navy intercept plane still in the concept but. When made the first time the 7,200 lb thrust engine has been designated for a Navy plane. The R-65 is now in production at Wood Ridge, N. J., also will be manufactured under license for the Navy. The division of General Motors.

North American Aviation has announced that a test model F-86B Sabre, the first one built, recently completed its 500th test flight after four years of strenuous flying. Test pilot George Welch said the plane landed as easily as its 500th flight as on its first.

The Theodore H. Case Award for 1951 has been presented posthumously to Maj. Patrick L. Kelly of the USAF. The Airframe of the Aeronautical Systems Award for Outstanding Achievement in Aeronautical Development recognized Major Kelly's work on techniques providing for structural stability and control of aircraft during high-performance phases of operation. The Kelly was killed in an air crash near Dayton in November 1951. The institute gave a medal award to Helen Seder of Wright Air Development Center's Aeronautical Laboratory for development of a high altitude rocket.

Continental Air Lines has received the first of seven C-47A aircraft from General Electric. The company is now in the process of receiving the first of seven C-47A aircraft from General Electric.

Boeing Aircraft Co. reports net earnings of \$18,167,165 for the third quarter ending Sept. 30. A dividend of \$2 per share was declared, payable Nov. 26 to stockholders of record Nov. 15. The third quarter net earnings of \$18,167,165 for the third quarter ending Sept. 30.

Dr. Charles M. Mautley will succeed Dr. S. D. Gossett as director of Physical Research of the Department of Defense Research and Development Board, according to an announcement by the chairman of the board. The appointment was to be effective Nov. 1.

The 616th Missile Test Wing at Holloman Air Force Base, Alamogordo, N. M., has been designated as the Holloman Air Development Center. The center will test and carry on research development related to tests of

proton aircraft, guided missiles and other equipment, in addition to research and development in space technology support research programs in guided missiles, electronics, atomic power, photophysics and psychology, and provide facilities for continuing and other agencies to conduct research and development operations.

Fair American World Airways plans to purchase from government buildings for \$355,073 at the Lincoln Airport, according to Reconstruction Finance Corp. One a period of 10 years PAA has paid a total of \$944,080 in rent to the government for the buildings.

Jack Ford, president of Electric, Inc., has arrived in Tokyo from a two-week tour of Japan. Ford is the president of the North Atlantic, Europe and Asia to the Far East. Ford has been in Japan for delivery to a Japanese newspaper.

The Boeing XB-52 Supersonic Bomber has been tested by USAF for a flight test and evaluation program. According to Boeing senior vice president Willard Hall, testing for production is presently completed. Hall said the only change being made from the experimental model was the use of a side-by-side cockpit instead of a tandem seating arrangement.

## Financial

Boeing Aircraft Co. reports net earnings of \$18,167,165 for the third quarter ending Sept. 30. A dividend of \$2 per share was declared, payable Nov. 26 to stockholders of record Nov. 15. The third quarter net earnings of \$18,167,165 for the third quarter ending Sept. 30.

Easton World Airlines had a profit of \$4,770,693, after taxes, in the third quarter of 1951. Total net for the first three quarters amounts to \$8,213,096. A third dividend of 1/4 of a share of common stock for each share of common stock held of record Dec. 15 will be payable Jan. 15, 1952.

Eastern Air Lines has borrowed \$10 million from a group of 26 banks, headed by Chase National Bank, to buy new aircraft and other equipment, according to New York Stock Exchange report.

National Airlines has obtained loans of \$12 million from three banks for purchase of new aircraft.

Northwest Airlines reduced a net profit of \$92,614 after taxes at the end of the third quarter of 1951. Net profit for the month of September was \$79,273.

Continental Air Lines reported a profit of \$129,713 for the third quarter of 1951. Net income for the first nine months of this year totaled \$138,673.

McDonnell Aircraft Corp. had a net profit after taxes of \$904,362 for the third quarter ending Sept. 30. Earnings after taxes for fiscal 1951-\$3,064,241.

Washington Electric Corp. earned net income for the first nine months of 1951 of \$18,741,000. The third quarter net income was reported at \$37,213,000.

Electrol, Inc., shows a net profit of \$19,621, for its monthly period ending Sept. 30. Electrol manufactures aircraft and industrial hydraulic devices.

Aeromarine Corp. has declared an extra dividend of 25 cents a share payable on Dec. 1 to stockholders of record Nov. 15. This was in addition to the regular dividend of 75 cents per share, payable at same time. Net earnings after taxes were reported in excess of \$900,000.

American Brake Shoe Co. reported earnings for the third quarter ending Sept. 30 of \$1,583,165, with earnings for third quarter of \$995,202. Production of castings for jet aircraft engines is expected to begin during fourth quarter at new facility in Morristown, N. Y.

## International

International Air Transport Assn. says world airline traffic levels are expected to rise during the summer according to airline executives for July and August put through the IATA clearing house in London for settlement. The July figures amounted to \$20,777,000 and August \$23,689,000. Previous record was \$18,881,000 in May, 1951.

The Far East and Pacific Office of the International Civil Aviation Organization will be moved from its present Melbourne, Australia, site to a city in the Asian mainland probably Hong Kong.

Canadian Department of Defense Production created contracts valued at \$1,218,000 for aircraft structural parts and equipment during the first two weeks of October. Largest order, \$1.2 million, was to A. V. Roe Canada Ltd., Toronto for repair and overhaul of aircraft.

## Wherever You Are



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## AVIATION CALENDAR

Nov. 10-11-12th annual convention of The Magnesian Assn., Hotel Edmore, New York.

Nov. 13-12-Tyler distribution/ annual meeting, Lock Haven, Pa.

Nov. 18-15th Annual Society of American Engineers on Aircraft Noise, San Diego, Calif. (For details, write ASA, 17 E. 39 St., New York 17.)

Nov. 27-28-First aviation meeting Open House Research Society of America, National Bureau of Standards, Washington, D. C.

Nov. 27-28-National Aviation Trade Assn. annual convention, Hollywood Roosevelt Hotel, Los Angeles.

Nov. 19-21-Fifth Annual Safety Seminar sponsored by Flight Safety Foundation, Honolulu, Hawaii.

Nov. 18-Dec. 3-Annual meeting of ASME, Hatch Studio and McKim, New York, N. Y.

Dec. 3-Fourth annual Air Cargo Day (ASME), Hotel Statler, New York, N. Y.

Dec. 2-Symposium on Lightmetal Body Design and structures for aircraft, SAE, ASME, IAS and AIME, Hotel Statler, New York.

Dec. 15-Aviation Distributors and Manufacturers Assn. annual meeting, The Knickerbocker, Miami Beach.

Dec. 15-Society for Experimental Stress Analysis, annual meeting, Hotel Marlquis, New York.

Dec. 16-18th annual Airline Aviation Conference, Douglas, Ala.

Dec. 27th Annual Weight Short course, T30 pav., Statler Hotel, Washington, D. C. Weight Short course to be presented by IAS 3 p.m., U. S. Chamber of Commerce auditorium.

Jan. 12-14th Annual meeting and engineering display of Society of Automotive Engineers, Sheraton Cadillac Hotel, Detroit.

Jan. 14-16-AIEE DER 53rd conference on High Frequency Measurements, Statler Hotel, Washington, D. C.

Jan. 29-31-Plant Maintenance Conference, Public Auditorium, Cleveland, O.

Jan. 29-31-Winter general meeting of the American Institute of Electrical Engineers, Hotel Statler, New York, N. Y.

### PICTURE CREDITS

7—Owen, Robert; 10—Woodward; 11—Woodward; 12—Woodward; 13—Woodward; 14—Woodward; 15—Woodward; 16—Woodward; 17—Woodward; 18—Woodward; 19—Woodward; 20—Woodward; 21—Woodward; 22—Woodward; 23—Woodward; 24—Woodward; 25—Woodward; 26—Woodward; 27—Woodward; 28—Woodward; 29—Woodward; 30—Woodward; 31—Woodward; 32—Woodward; 33—Woodward; 34—Woodward; 35—Woodward; 36—Woodward; 37—Woodward; 38—Woodward; 39—Woodward; 40—Woodward; 41—Woodward; 42—Woodward; 43—Woodward; 44—Woodward; 45—Woodward; 46—Woodward; 47—Woodward; 48—Woodward; 49—Woodward; 50—Woodward; 51—Woodward; 52—Woodward; 53—Woodward; 54—Woodward; 55—Woodward; 56—Woodward; 57—Woodward; 58—Woodward; 59—Woodward; 60—Woodward; 61—Woodward; 62—Woodward; 63—Woodward; 64—Woodward; 65—Woodward; 66—Woodward; 67—Woodward; 68—Woodward; 69—Woodward; 70—Woodward; 71—Woodward; 72—Woodward; 73—Woodward; 74—Woodward; 75—Woodward; 76—Woodward; 77—Woodward; 78—Woodward; 79—Woodward; 80—Woodward; 81—Woodward; 82—Woodward; 83—Woodward; 84—Woodward; 85—Woodward; 86—Woodward; 87—Woodward; 88—Woodward; 89—Woodward; 90—Woodward; 91—Woodward; 92—Woodward; 93—Woodward; 94—Woodward; 95—Woodward; 96—Woodward; 97—Woodward; 98—Woodward; 99—Woodward; 100—Woodward.



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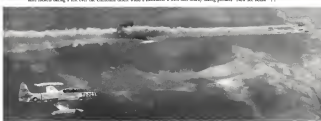
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City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_



STARFREE FIRST AWAY—Endorsed in smoke and flame, a Lockheed F4U Corsair (upper center) from a cadre of 275th Army Air Corps during a test over the California desert while a Lockheed P38A was usually taking pictures. New one below.



SMOKE LATER—Although the colors are well on their way, the Statler is still flying blind. The off-center second snapshot has comfortable aviation equipment for sending its target and firing its missiles automatically.

## Military Aircraft In Action

FLIGHTING: HELIFORT—A Marine Corps Sikorsky HO4S, tailfin Lockheed, lands from the Korean coast during a training problem, program to land on the most common U.S. field. Another HO4S can be seen on the coast's shore.



# Remington Rand Methods News

## The case of the punch press that was not popular

When a well-known manufacturer switched to Remington Rand punch-and-die cutting, the new method required revised engineering designs in the shop.

For instance, one report indicated a certain type of punch press was the most efficient in a particular operation. But another report showed the press was not being used on this operation. Investigation revealed that workers preferred a different type of press which was easier to operate. Management now had all the facts needed for effective action.

What's more, this new system got the finger on profit links much faster. Instead of making 50 days to get slotted holes, management now gets complete cutouts in 3 days after completion of a job.

Naturally, working in just part of the punch-and-die cutting operation which leads the firm produce better products at lower cost with better service to customers. Let us show you how it also simplifies materials management, production control and payroll. Ask for our history folder, RM-732.

If you'd like extended in-punch-and-die services to get the most intensive assistance without sending up your own punch-and-die department, let us (ESD-6).



**NEW MANUAL HELPS YOU SLASH PUBLISHING AND PRINTING COSTS—** Here are 20 pages of practical information on the publishing department, as given before complete information for small publishing departments. Learn how to save and how others profit by using the Remington Rand methods and procedures. Covers every phase of paper work from receipt of copy to the closing of order file. Ask for manual S-1202



**TOOL STAY UNDER CONTROL.** See goodness in your established tool check-out methods. This simple system started with double check-out to prevent errors in changing tool bits. ... trouble-free tool control to keep it all working smoothly. ... results ... give you tool inventory control as a by-product. Get details from folder ESD-111.

## How a plant doubled its turnover rate on parts and materials

Within six months after getting in a new materials control program, the plant increased its parts inventory by a million dollars—and doubled its inventory turnover rate. It also eliminated a better control system against shortages. Read folder.

Because delivery schedules for incoming materials were tied in closely with production schedules, the plant was eliminated on inventory handling of material and warehousing.

Heart of this system was a Remington Rand control record giving fast check-up on status of each individual item. Without referring to ledger entries, the clerk could spot any item which threatened to slow production.

Let be detailed analysis, this type of record also furnishes a complete and continuous history of each item including purchases, usage and projected requirements for coming months.

Whether you have 50 or 50,000 parts, you will find this flexible method is available for maintaining the proper balance between the cost of acquiring, as item and the cost of possessing it. If you have punch-and-die production records, this method provides a positive supplement to your control system. For details, see our methods RM-702, available on loan for your study.

## QUICK RELIEF FOR COMMON HEADACHE IN PRODUCTION

A small part can cause a big headache when it's the wrong part. For descriptions of parts causes of trouble, production delays, duplicate stock and high inventory costs, but the cost is simple. Identify and classify each item properly, so it can be referred to by exact number. The cost is less than you may think. Get engineers have built up a special library of standard nomenclature and numbering systems which can be readily adapted to your particular method. For more details, see our booklet ESD-16.

## Remington Rand

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## WHO'S WHERE

### In the Front Office

**Solomon E. Paine** has been named president of Paine Mfg. Co., an lighting equipment firm at Newark, N. J. Paine, 36, of which father is president, recently produced a suspension clock in Paine.

### Changes

**Vol. Cresswell** has been appointed director of engineering for the Gas Turbine Division of A. V. Roe Canada, Windsor, Ontario. He formerly was with Pratt & Whitney Canada.

**F. A. Smith** has been designated R-47 project engineer at Lockheed Aircraft Corp., Cherry Grove, Missouri.

**M. R. Strickland** has been named general superintendent of aircraft fabrication and machining for Kaiser Aircraft Corp., Willow Run, Mich., to handle design work for the C-119 and C-123.

**Edwin J. Ruckelshaus** has joined Lockheed Electric Co., San Carlos, Calif., to handle engineering of applications of electronic equipment to VHF and microwave radio links.

**William G. Murray** has been appointed technical sales engineer for Parker Aircraft Co. with headquarters in Pittsburgh.

**Robert O'Hara** has been named international traffic and sales coordinator for Phillips Air Lines, with headquarters in Miami.

**John MacIntyre** has joined Alcoa Research Mfg. Co., Los Angeles, to deal exclusively in public and industrial relations.

**Louise B. Knapton** has been named general manager of Northwest Airlines Group, Memphis, B. J. King, who is returning to the U. S. from the Philippines.

**Raymond H. Jones** has been named manager for General Electric, Wichita, Kan., to handle a production branch, South Dakota, Kan., for the Lockheed International Aircraft, Inc.

**Dr. Max Koenig**, German wartime guided missile scientist, has joined the engineering staff of Coleman Engineering Co., Los Angeles.

**Dr. Elmer E. Roberts** has joined Naval Laboratories Corp., Millard, Conn., to serve research engineer.

## Honors and Elections

**Col. Andrew Stevens**, president of Phillips Airlines, has been given the National Safety Council Award of Merit for the aircraft's track of 1,071,000 man-hours without a lost time injury from Mar. 27 to Jan. 30.

**Ray G. Jones** of Bendix has been elected president of the Air Science Association of the U. S. Col. A. B. McMillan has been selected executive director.

**Malvin H. Seifert**, head of the Aeronautical Engineering Department of the University of Wichita, has been named chairman of the Wichita Section of the National Institute of the Aeronautical Sciences.

## INDUSTRY OBSERVER

**Aircraft** workers with cost-benefit pension plans in their wage contracts can expect a reduction of up to two cents an hour when the next cost of living index is published at the end of November. For Dec. 1 wage adjustments. The rate of living index has already slipped one point during the past two months with indications strong for a continuing downward trend during November.

**Employment** in the aircraft industry has a post-war high—718,000 people working in 207 aircraft, engine and component factories by the beginning of September. Increases during June and August were at a rate of 5%. Department of Labor forecasts another 7.5% increase by next February.

**Marine Corps** is extremely interested in using the Chance Vought F4U Corsair as a ground support plane. Ragged construction of the Corsair makes it too vulnerable to small arms ground fire and it can carry a heavy external load of bombs, rockets and rockets.

**North American Aviation** has two successful operational tests with its new engine device touchdown rate of descent indicator (LORD). With the PT-2 Navy version of the Sabre on the carrier Midway. The device indicates the rate of descent optically with an accuracy of 0.4 ft./sec. so that data is available for the pilot as soon as he feels and sees that an emergency climb to avoid rate of descent for further landing is necessary. The engine system for measuring the rate of descent did not supply immediate data.

**First operational test** of the new hydraulic engine valve to prevent inadvertent popovers, involving new home developed experimentally by the Hamilton Standard Division of United Aircraft Corp., as expected to be made with one propeller governor on an American Airlines DC-6.

**Hiller Helicopters** recently delivered two UH-12B helicopters to the State army for observation, rescue and liaison missions.

**Vencomet** is here has taken delivery at Wichita of three photographic phase modifications of the T-16 Ranch Model D1B5 and will deliver them to Vencomet. The plans are described as improved version of the T-16 Ranch Model D1B5. The plans are described as improved version of the T-16 Ranch Model D1B5. The plans are described as improved version of the T-16 Ranch Model D1B5.

**Flight Refueling, Inc.**, a new insurance underwriter has already collected data of a flight-refueling survey. The plan involves an operation over the North Atlantic, personnel would be lower than those for aircraft which had to make fueling stops. In-flight refueling would eliminate two of three aircraft and loading an otherwise required with accompanying reduced hazards of these operations. Using the higher rate of fuel flow of 600 gpm, now possible in the pump-discharge refueling system which Flight Refueling, Inc., operates, it is claimed that a complete operation of refueling a C-54 at 10,000 ft. could be completed in less than four minutes. Commercial refueling would probably be reduced from military procedure with the refueling tanking the line and the tanker leaving up from behind to make the contact.

**Bendix Aviation** has delivered its first production line jet-engine combustion chamber, a 74-hp turbine unit which develops 140 hp, to the Rock divisions of General Motors Corp., at Flint, Mich., for installation with a Supracat jet engine in powerplant for the Republic F-84F fighter.

**National Bureau of Standards** has developed a laser line used to determine whether laser standard components of planes have been stressed. The laser line is used to determine whether components have been stressed. The laser line is used to determine whether components have been stressed. The laser line is used to determine whether components have been stressed.

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NEW TRI-PACER—Piper will try to sell 50% more of these in 1953

## 1953 Piper Pacer and Tri-Pacer

### Specifications

	Pacer PA-20	Tri-Pacer PA-22
Engine(s)	200 BHP	200 BHP
Power and rpm	151 @ 2,800	131 @ 2,600
Cross weight, lb	1,920	1,950
Empty weight, lb	1,050	1,040
Span, ft.	29.3	29.3
Length, ft.	28.4	28.4
Height, in.	74.5	100
Wingspan, ft.	100	100
Fuel cap, gal.	18	36
Top speed, mph	139	137
Cruise speed, ft.	125	121
Stall speed, ft.	48	48
Climb, ft.	500	500
Cruise range, mi.	560	600
Service ceiling, ft.	15,000	15,000
Fuel econ., 75% power, gal/hr	7.7	7.7

	Pacer	Tri-Pacer
Standard	\$1,985	\$1,995
Options	6,045	6,095
Sever Citation	6,975	7,105

## Distributors See 1953 Pipers

Piper Aircraft Corp. distribution will gather at Long Beach, Pa., for the annual meeting Nov. 11 and 12 to wrap the 1951 sales campaign. After it is over they will take with them approximately 90 new Pacer and Tri-Pacer demonstrators to show the craftsmen at home.

Of particular interest to distributors and customers alike is Piper's decision to hold the line on prices for its new-purchase (title) Piper's. The Piper's, however, are going up approximately \$3,500 on the 170-type to a price about \$1,000 above that for each Piper dealer's own sell as regular.

Sales in the final year ending Sept. 18, Piper sold 1,559 planes in civilian, broken down that 465 PA-22 Tri-Pacers, 141 PA-20 Pacer, 285 PA-18 and 143 PA-15A Super Cubs, plus

several hundred military versions of the Super Cub.

In fiscal 1952, Piper's production goal is 1,400 new planes. It expects to double PA-18A agricultural plane output and is aiming to increase Tri-Pacer sales by 95% over last year. The new models until the previous year's general reconditioning but many new refinements have been incorporated, notably larger cabin area, lower stall level inside and instrument panel designed to take the large variety of exceptional skills becoming popular, especially among business owners.

Larger interior—There's 18% more cubic feet in the 1953 Pacer and Tri-Pacer, making room for more than 60 in. of shoulder width in the front seats and nearly four inches in the rear.

Modification of the welded steel sub-

ing structure behind the cabin has permitted doubling baggage area from 6 cu. ft. to 12.5 cu. ft. and weight allowance increase 100% to 100 lb. By carrying a full stall behind the rear seats, baggage capacity goes up to 16 cu. ft. And further, by moving the rear seats, the plane's cargo capacity becomes 42 cu. ft.

Noise reduction—Installation of a large pressure steel exhaust muffler and use of a heavy Plexiglas cowling around the cabin, with double thickness on the firewall and engine cowling, has sharply reduced engine noise. Section of the landing gear engine have been equipped with automobile-type sound-absorbing material and a quilted pad has been fitted forward of the instrument panel to cut noise.

By using a heavy gear Plexiglas and using the old window Piper engines have succeeded in further reducing the noise level.

New Panel—A variety of instrument modifications are possible with modification of a basic mid-panel layout for cut holes for gear dials and a doors other instruments. Also, the owner can get several optional face plates to handle various combinations. The "optional cut" inboard under the engine of cutting up the board for installation of additional instruments after the plane has been purchased.

Maintenance is facilitated by having a large removable panel in the belly permitting easy access to vibrator mechanism, radio loop and controls.

## UAW Asks Probe Of Aircraft Wages

A government investigation of wages and collective bargaining in the aircraft industry is being requested by the UAW-CIO to look up wage demands the union plans to make on the industry in 1953.

The union demanded assembly at a three-day UAW-CIO national aircraft conference in Chicago Representatives of UAW-CIO aircraft plants, choosing to represent about half the country's 44,000 aircraft workers, gathered. They also heard talks by Air Force Undersecretary Rowell L. Gilchrist and John Flanagan, Assistant Secretary of Navy for Air.

UAW-CIO wants a "government committee" set up to "investigate" charges that aircraft manufacturers are taking advantage of workers by paying low wages and treating employees unfairly while obtaining benefits for itself from the government. UAW-CIO wants aircraft workers pay scale would set up such a committee. The suggestion will be made to Congress and to Air Force Secretary Thomas K. Phillips.

UAW-CIO maintains that there is a wage differential of more than 20 cents an hour between the aircraft and automobile industries which it wants corrected. Other major demands the union included in its "economic program" for next year.

- Automatic progression, within a rate step, of five cents an hour every 10 days.
- Cost-of-living standard.
- Annual productivity increase.
- Minimum pay of \$152 for every year employed up to \$1,380.
- Employer-paid health insurance covering hospitalization and to hospital inpatient for a worker who, by family disability pay of 50% of wages and life insurance of one year's wages.
- More liberal vacation and retirement plan.
- Right paid holidays a year.

The conference also "resolved" to (1) Try to get the \$105 Walsh-Harney Act removed from government contracts in aircraft after \$1.50, (2) pressure "labor-management" committees for the purpose of exchanging information on union demands and company policies, (3) intensify the organization of office workers and engineering and technical personnel.

## USAF Speeds Up Contract Letting

An Air Force letting contract for aircraft and related procurement at a high rate, last Nov. 9 began.

For the first quarter of the recent 1951 fiscal year—July, August, September—Defense Department's Office of the Comptroller reported.

USAF obligated \$4,987.5 million. USAF had a total of \$12 billion to obligate for the year. \$11 billion in new obligated authority and \$1 billion carried over from previous quarters. For the first quarter of the 1952 fiscal year, USAF obligated \$1,489.9 million. New obligated \$740 million. This was substantially below obligations during the first quarter of 1952 fiscal year which totaled \$1,386.5 million. New \$3.9 billion to obligate this year \$5.45 billion to new obligated authority and a \$15.1 million carried over from earlier budgets.

A spokesman for Bureau of Aeronautics said that personnel limitations on Washington employment, where the government's aircraft industry is the main source for the Air Force, helps to explain the slow rate of letting.

Expenditures, or actual payments, for aircraft and related procurement of both the services are up sharply over last year.

For the first quarter of fiscal 1953, the Defense Comptroller's Office reports

## Airport Construction: A Progress Report

(Figures in millions of dollars)

	1947	1948	1949	1950	1951	1952	1953	1954	1955
Programs authorized	2,247	1,048	1,048	1,000	1,000	1,000	1,000	1,000	1,000
Actual expenditures	1,447	991.7	991.7	991.7	991.7	991.7	991.7	991.7	991.7
Actual expenditures	1,447	991.7	991.7	991.7	991.7	991.7	991.7	991.7	991.7
(1) For small airports	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
(2) For large airports	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
(3) For large airports	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

## Local Airports Await U. S. Funds

Local communities set ready to finance their share of a \$150 million airport development program, but are waiting how much better these are to be before starting funds.

Cost—Administration estimates that facilities and other have already authorized \$75 to \$100 million for airports and would be prepared to get up to total of \$150 million if they could obtain matching funds. Under the 1948 Airport Act, the federal government is authorized to pay up to 50% of the cost of projects. Localities bid, in financing the total cost of facilities, it means that in the prospect of federal assistance being given to them.

The story of the airport program is similar to that of most civil public works programs.

Although it showed only estimates in 1947 and 1948, Congress said year has not been appropriated in its economic efforts. From a \$42.7 million appropriation in 1947 fiscal year, support expenditures, however, have declined to a low of \$11.7 million for the current fiscal year.

Small Airports—Under the policy since the 1948 act is concerning airport development, most airport projects have been barred. In the 1948 fiscal year Congress made plans of \$11.7 million for small Class I, II, and III projects. In the 1952 fiscal year plans added up to only \$5 million. The two-

million expansion of existing airports, CAA reports, has accounted the deficiency in world funds.

The airport program is lagging behind on its own schedule. For seven years from the 1947 fiscal year through the 1951 fiscal year which each next July 1, Congress has appropriated only \$195 million.

This amounts only 46% of the program originally completed and authorized. A \$150-million program, with the federal government putting up \$75 million or half its cost over a 10-year period. If this program is to be solved, it means that Congress will have to appropriate more than \$150 million, or an average \$60 million annually, over the next five years—an unlikely prospect.

Land Passage—Recent from localities working for federal matching funds to build projects may result in a bigger appropriation than the \$11.7 million which Congress allowed for the current year.

But even a \$100-million appropriation from Congress over the next five years, going the way for a \$600-million program, would, according to CAA, fall short of meeting the nation's airport requirements.

CAA has reported that a \$600-million program, with the federal government putting up \$300 million and localities the remaining \$300 million, is the most realistic way, it is required to meet airport needs.

pendure at least 50 San Vences jet fighters at Bendish, Sydney, to replace obsolescent Brewster. Six new piston fighters now used as Australia's two main.

De Havilland—Australia has completed three quarters of its order for approximately 80 Vampire jet fighters for the RAF and no further Vampire production is expected. There is being conducted on the two-engine Vampire trainer which has been ordered by the RAF and Royal Australian Navy. Only a few of these will come off the line this year.

## Australian Venoms

(McGraw-Hill World News)

McGraw-Hill—The Australian Navy and Dept. of Defense Production reportedly are looking plans for the Australian to

## Design Completed For New Aussie Jet

(McGraw-Hill World News)

**Melbourne**—A new Australian design for a supersonic military jet aircraft, combining American, British and Continental principles, as well as some new, has been completed in Australian reports, has been completed in the Commonwealth Australian Research Laboratories at Fishburn's Road, here. No details are likely to be disclosed for some time but foreign experts based several features suggested and of potentially great use.

With production of Sabre and Canberra fighters already behind schedule, experts fear Australian production capacity may not be able to withstand further delay. It is feared that both construction costs and production capacity will be too low to build a prototype.

The first Australian-built Sabre jet was expected to be completed by last flight only April 1955 and the first Canberra jet bomber will not be available for tests until February 1955.

Australian preparations for the "jet age" include plans for nearly 100 jet fighters at such places as Darwin, Townsville, Perth, Adelaide, Amberley and Wilkesbarra. Work is expected to start in some as funds are allocated for this purpose.

## Twinn-Turbine Copier Studied by Doman

A twin turbo-powered engine, proposed to meet the engine needs for rates, wing aircraft in water support and export markets, transportation is under development study at Doman Helicopters, Inc., Danbury, Conn.

Availability will be dependent on certification of the concept—the 200-hp, Boeing 302—scheduled for use in the engine, which is projected as a conversion of Doman's 12-cylinder engine, powered with a single 1,000-hp, 400-hp piston engine. Certification of the twin-turbine engine should not be difficult because the craft would be within the present design load factors of the 12-cylinder.

**►Proposed**—In the proposed engine, the dual turbines will power the area rotor through a common gearbox. No engine water is likely to be in contact with the engine, and the craft will have a more reliable operating life. The engine reduction and the variable rotor operating speed should give the engine a minimum of wear of both used load and drop speed, as well as being rugged and reliable.

Useful load on the LZ-5 is 2,140 lb. In the proposed twin-turbine engine the useful load may be increased by about 300,000 lb., probably to be achieved by adding the gear to be dropping the empty weight.

Design is now building a model vacuum system of the LZ-5 for the military. Known as the LZ-5, it is intended for testing to a normal gross of 4,400 lb., actual of the LZ-5 is 5,000 lb. gross, to achieve desired rate of climb and altitude performance for military operations.

## NWA 2-0-2 Suit Goes to Trial

The \$790,000 damage suit brought by Northwest Airlines, Inc., against Oliver L. Martin Co. was alleged to be for 143 lawsuits against last week in Federal District Court, Cleveland, with Judge French fixed per trial.

Northwest alleges that because Martin did not use reasonable care in design, selection of materials, process of manufacture, workmanship, inspection and testing of the lower wing ribs on the planes, NWA lost one of its aircraft in flight over Wisconsin Aug. 29, 1948.

Three years, 10 months and 10 days ago were killed and the airline claimed a reduced property loss of \$149,000, while the compensation claims for the case of \$25,000 and an additional \$590,000 because the other lost planes were grounded to prevent further wing ribs.

Martin asserts that the five planes in question were constructed by Northwest after the airline's engineers and CAA specifications were not available, that the supercritical wings in which the wing ribs were used were not used by other commercial airlines while the Northwest pilot died in flight through it.

## ICAO Elections

**Montreal**—Dr. Edward Warren, president of the council of International Civil Aviation Organization, has announced election of three vice-presidents and of members of ICAO committee.

Vice-presidents of the council elected by secret vote were: first vice-president Dr. Joseph M. Hertz, Nevada second vice-president Dr. J. T. H. Hertz, Nevada third vice-president Dr. John C. Hertz, Nevada.

Dr. Hertz, President of the Council, is also chairman of the Air Transport Committee. He is also chairman of the Council on Joint Support of Air Services Area Services. At a previous meeting

Walter J. Hertz (Argentina) was elected chairman of the Air Navigation Commission.

## Air Industry Receives Materials Quotas

Defense Production Administration says it has allocated defense and civil aviation short all their requirements for controlled materials—steel, aluminum and copper.

Ralph S. Trigg, DPA deputy administrator for programs and requirements says DPA has adhered to its policy of giving military and atomic energy requirements—despite the steel shortage.

Defense allocations for the first quarter of 1955 total 2,278,890 tons of steel, 365,160 tons of copper and 255,000 tons of aluminum. NPA aviation allocations get 8,516 tons steel, 1,094 copper and 9,692 aluminum for civil aircraft. The only net affecting allocations was an 11% reduction in nickel stainless steel for manufacturing copper and operations supplies—used for high stress in repairing aircraft fuselages—but the aviation will be able to absorb the temporary reduction in their steel requirements according to the CAA's Office of Aviation Defense Requirements.

The CAA got 12,120 tons of steel, 549 copper and 468 aluminum for its reports and answers made.

## Committee Reviews Air Base Program

An Air Force task force is studying lack of its long-range \$10 billion or more construction program. A Projects Institute Committee member specifically at reviewing construction programs, has been established with Assistant Secretary V. V. Higgins as chairman.

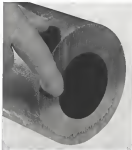
Air Force action follows hearings by the Senate Committee on Military Appropriations last week when charges were made that USAP was building too many bases and engaging in too many aviation projects particularly in North Africa and Ceylon.

An Air Force will submit a plan for the largest share of the \$10 billion in aviation construction program that the Pentagon will ask from Congress next January is the first step in the program. It has been found that the cost could be reduced by some 10%.

It is also the Projects Institute Committee's job to establish.

To make the program get a share from Congress, the task force will be the detailed review and review of project construction programs will be under 14-day in-house committees who will report to the committee.

# Two ways hollow-part makers can save steel with TIMKEN® seamless steel tubing



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You make your machine tools more productive by using Timken seamless tubing. Since you don't

## 2. MOST ECONOMIC SIZE!

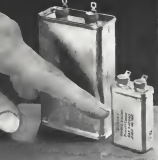
have to drill the center hole, screw machine sections can be selected for other operations. You get added machine capacity without additional machines.

You get a better quality product, too. The parting operation by which Timken tubing is made is basically a forging operation. It gives the tubing a uniform spiral grain flow and a refined grain structure that brings out the best in the quality of the metal. And the Timken Company's rigid control makes sure this quality is uniform from tube to tube and lot to lot. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio, Cable address: "TIMROSCOP".

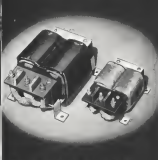
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For electrical equipment that saves space and weight, take a look at these G-E Aircraft Components. Up to 80% smaller, carefully built and tested, they can mean greater efficiency for your aircraft's electrical system.

Check the features of the G-E "Flyweight" Silicone Autotransformers—the most space-saving transformer design in years.

Note the tiny size of the Permafo-D-C capacitor... every bit as dependable as larger bead-filled units. And see what G-E's Airborne Transformer Rectifiers can do towards eliminating heavy, unnecessary d-c generating equipment and long line runs.

The next time you specify electrical components, call on your local G-E representative. He can recommend just the equipment you need for better aircraft performance. And for more information on the units shown on this page, write to Section 219-ABC, General Electric Company, Schenectady 5, N. Y.

*You can put your confidence in—*

**GENERAL ELECTRIC**

## AERONAUTICAL ENGINEERING



MYSTERE PROTOTYPE, M. D. 452 Mk. 1, is usually a sweeping mouse of M. D. 450 Osprey, powered by a Rolls-Royce Nene.

## Exclusive Report on M. D. 452 Mystere

- In the sweeping Mk. 2, the French have one of the five best jet fighters now in production.
- This is the finding of Aviation Week's engineering editor after first-hand study of the plane.

By David A. Anderson

Paris-Madrid Dassault's Mystere 2 is the last thing that has happened in the French aircraft industry since the Spad. With performance that matches both the Mig and Sabre, plus a heavier punch, this caters the reigning Mystere 2-one of the five top fighters in the world—is in production for the French Air Force. Its performance, the straight-winged Osprey, is in equal row service. The newer Mystere 4—which will compare to tomorrow's USAF fighters—is coming along to follow the Mk. 2 down the production line.

Heavy U. S. General looking of the Mystere for fiscal 1955 all these pre-emptive has followed an evaluation of the airplane as a possible weapon by a joint team of U. S. military and civilian specialists (Aviation Week On 11, p. 11). This action the Mystere is a table item in an industry which has long been noted for versatility.

Manufacturers—Mig U. S. and British observers are inclined to dismiss the Dassault effort—and in fact, the whole French aircraft industry—with a few erroneous generalizations. One of these is a supposed lack of production ability and space. Another is the purported lack of armament, equipment and even armaments which makes the airplane lighter and therefore helps

their performance. A third is the chronic distrust of anything foreign.

The latter of these notions shaped last spring by the Mutual Security Agency and the USAF didn't help the Dassault cause any. MBAs' release was certainly dramatic about the Mystere as compared to the F-86 Sabre, having its eye on evaluation flights conducted by a top USAF pilot team. Air Force contacted with a store different in detail, which didn't effectively deny the MBAs' arguments.

Final truth about the Mystere will never come out until the type has been battle-tested. Meanwhile, Aviation Week presents the exclusive analysis of the airplane and the production possibilities of Aerosol Model Dassault.

► **The Airplane**—The Mystere 2 is a single jet, single place monoplane, with low wing, swept at about 35 deg. at quarter-chord.

The prototype Mystere 1 was powered by a Hispano-Suiza Nene, built under license from Rolls-Royce, and rated at 3,000 lb.-an hour static thrust. Production version—Mistral 2—will feature two gas-turbine installations: H.E. Turb, centrifugal-flow engine, rated at 3,200 lb. an hour static thrust, or the M-11C, axial-flow jet, rated at about 3,500 lb. an hour static thrust.

The prototype first flew in February 1951; the first pre-production Mystere 2 was delivered to the company's flight



Mistral Dassault Mystere Mk. 2

test base at Villeneuve in July 1952, the second pre-production ship followed as possible.

Peak production of the craft will be reached by March or April 1953, first order total 340 complete airplanes.

► **Structure**—The Mystere is conventionally divided into major components of fuselage and rear fuselage, wings, and tail surfaces. With the exception of engine ducting, which enters in the two re-





# Valve Talk

for WM. R. WHITTAKER CO., Ltd.

By ARTHUR MILES,

Senior Member, Aviation Writers Area



His title is Air Force quality control representative, but most people refer to him as "the inspector."

At the Wm. R. Whittaker Co., Ltd., he's regarded as a team player... a cooperative, fair-minded cooperator, a man who can mix down discrepancies, bent problems, turn up information.

Actually, he is not one, but three men... the three resident Air Force inspectors at the Whittaker Co., and they do the same work that required perhaps fifteen men in World War II.

Their job is to check Whittaker's quality control system, to fraction it on the ground "double-checkers" of the company's own inspection procedures.

There is a standard and consistent procedure that defines a statistical schedule. Sometimes it is 100 items up to three months to complete the checking cycle. The work, when I called with them, they were without tools and again. Next week they might be on purchase order procedures, drawing material, design, and records, type and fixtures or sampling methods.

They are interested mostly in performance as it relates to Whittaker's Air Force inspection inspection manual for purchasing, manufacturing and shipping. They make regular checks of various procedures and production items, paying special attention to those points most critical to the final application of the product.

Under its approved quality control rating, it's up to Whittaker to see that its production meets all requirements. The Air Force also simply checks to see that that responsibility is being met.

One of them explained:

"Sure, we receive little bugs here and there at Whittaker, you find them in all plants. But the rejection rate here is exceptionally low."

These Air Force representatives are Federal civil service employees, working directly under the Los Angeles Regional Office of the Air Materiel Command and reporting to Major Henry Batterson, Chief, Quality Control Branch.

They follow all contracts and purchase order closely matching requirements with Whittaker's performance according to established procedures. They're busy indeed for the country, from late into hundreds of different vehicle water sub-contract to the

points or on direct government order for the industry.

When they find a discrepancy it is taken up immediately with Whittaker's chief inspection, Bob DeWitt at Torrance, or Ernie Espinosa at Hollywood and remedied immediately.

I wondered of course at Whittaker's reputation for the Air Force representatives' work as "bureaucratic" and revealed a "too the contrary," advised Ernie Revellado, "there is close and complete cooperation between our company's largest and Air Force representative area."

Until a short time ago the Navy as well as the Air Force maintained facilities at the Whittaker plant. Today the Air Force handles quality control representation for Whittaker's Navy production as well as its own. This cooperative system reduces any statistical inspection costs.

While they are called on as special agents to witness laboratory standards here or to check out a vital emergency order, then Air Force engineers in that of purchasing routine, bug material is scarce, especially at Whittaker. It is focusing under single standard quality control with all major both government and commercial, both to government specifications.

The biggest headache, according to the Air Force men, is the voluminous paper work required of this system, including a full daily report of all activities in quality control.

This, then, is the "bottled the source" story of "bureau inspection" and demands this story, I submit the man who makes it work... the Air Force quality control representative.

most proud of three Mystere 4, and on the second lot. This plane, which made its first flight late in September, is a climbing Mystere 2.

New features on the Mystere 4 include a wing with more sweep and a thinner section. Sweep angle has been increased to about 40 deg. Alterations have been made in fuselage items, changing them from circular to rectangular, with the larger diameter at the bottom. The flat front windhead of the Mystere 2 has given way to a V-front panel on the 4. The canopy is larger and thinner.

Powerplant for the new craft is reported to be either a Pratt & Whitney J44, built under license by Hines, or the Alou H10.

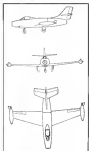
Other features—like Mystere tail lower from Dornier experience with the Ouragan, usually in squadron service with the French. Ouragan is a straight-winged conventional jet aircraft, powered by a Hispano-Suiza. Armament of the Ouragan is four 20 mm. cannons. Cockpit is pressurized and an ejection seat is installed.

Ouragan has a wingspan of 39.1 ft. without tip tanks and 45.5 ft. with tanks. Overall length of the plane is 35.3 ft. and three-point height is 15.6 ft.

Basic structure of the Ouragan is the same as the Mystere.

The Mystere de Nuit is a further development of the basic Mystere airframe. None of the plane has been redesigned with side intake and a two-place cockpit. Otherwise it is the same as the production Mystere.

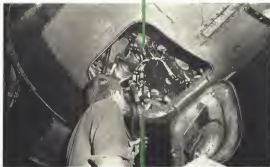
Gross weight is up around 18,000 lb. It is living with the Hines Tey without



M 10 Ouragan



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**VOLUME REDUCTION—REGRIFT SHIFTS.** A section of the Fernald shipping room, showing racks destined for some of the most prominent aircraft manufacturers. A sustained high production rate assures speedy delivery of all types of Fernald aircraft racks. For complete data on the Fernald rack that will meet just over particular requirements, write Fernald, Incorporated, 1211 Phoenix St., Oakland, Mass.

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- **M.D. 411** *Alkalo*, proposal the right. Lightest line on Chompa. Drops only.
- **M.D. 452** *Mk. 1* *Mytme*, the potter, actually a trapping version of the *Chompa* but with a line. Near
- **M.D. 493** *Mk. 2* *Mytme*, the potter, version, passed off ultimately by the *Itano* Tsu, in *SENK* *Mk. 195C*.
- **M.D. 492** *Mk. 5* *Mytme* to *De*, a trapping night-fighter version also known as the **M.D. 411**.
- **M.D. 492** *Mk. 4* *Sholone*, lightest potter of *Mytme* line, with occasional *Chompa* and *Mytme*.

afterburner, expected performance is  
non-linear.

A modified Onagun with side skirts served as a test vehicle for this powerplant installation.

✶ **Factory Space**—Dassault operates a complex of six plants, in which it produces the Falcon, the MD 311 (two-engine light transport), and jet fighters. Total employment is only 7,500 but 25,000 French aircraft workers throughout the industry help to build Dassault planes.

Factory vans are small by U. S. standards. Here's how they stack up.

- **Sy. Chond, near Paris, 190,000 sq. ft.** This plant is the engineering and assembly factory for Citroën.

- **Agriplast**, near Pune, 100,000 sq. ft. This is for production of lighters.
- **Villanale**, near Mohan, 100,000 sq. ft. This is the experimental lighters unit.

• **Miriguan, near Buenos Aires, 220,000 sq ft.** This is the currently largest for fighter and the two hangar.

- Valencia, near Bordeaux, 100,000 sq ft. This facility handles production of components for two-vehicle transports.
- Coblentz in Missouri, 63,000 sq ft.

I visited three of these sites—St. Cloud, Morgan and Villavieja. The plants are all cut from the same cloth. Finest unshorned pasture with a French flax has produced a series of light, feathery seedlings of exceptional beauty for futures.

High necked steel rods are supported as a splices, pile-girders transverse, built of light structural steel sections. Walls and floors are a light grey, light in frequency is high, which makes for good working conditions.

■ **Machinery**—Dumail's prototype shop is well merchandised. Machinery lists are closely spaced; tools are a mixture of French and foreign types. All the machinery is general purpose—there are no special tools, such as *l'outil à l'usage*.

Labour relations is excellent, and good

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by the  
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The demands of supersonic flight for pistons, valves, and many other parts varied. Before the Douglas Skyrocket took to the air—on March 18, 1950—the test team, however, Douglas engineers brought in the A-1W Hypalon Company to solve certain timing problems with extremely accurate timing. A wide range of timing problems in military and civilian aircraft are being solved by the application of pressure A-1W Hypalon laminar, designed to meet aircraft's needs.

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Machines capacities from 12½ to 200 tons in standard Models. Write for catalog CP-302.

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ribbons are crimped between wing-section and the fuselage. Dussault has had no major strikes, but lost almost none time since war's end. At St. Cloud, the Dussault shops are only a few doors from the nearest French plant, active in World War I and earlier. The labor has been there since then but been a French aircraft industry.

A motorcycle is awarded to the best worker at the St. Cloud plant each month, a practice which has been in existence for three years. There are a few women workers in the Morane factory, but none at St. Cloud. The latter shop also has the craftsmen—the average workman has spent years in his job and spends himself as a Roden in rectilinear. Consequently you get the best kind of worker you could want for an experimental shop.

► Production—The Champs is currently the big production effort at the Dussault factory. Original order for this craft was for 450, but this was later cut back to 370, and the 350 ordered were converted to Mystere orders.

Production is supported by extensive subcontracting to the French national and factories of the Southwest and Southwest. SNCASE builds the forward fuselage sections, and SNCASO builds rear fuselage and wings. The tail sections are fabricated at Dussault's plant at Agenholm near Paris.

First production Dergens was delivered in January 1952. By the end of the year, 55 will have been delivered. Final production rate of 22 per month will be achieved by February 1953.

Scheduled production of the Mystere 2 is being planned in accordance with production prototypes in the lightest stage. Tooling and jigs are well along, and all stocks have been purchased. There have been some delays in the program because of the problems of all these procurement policies. But Dussault is ready to go, and is in limited production of the Mystere 2.

NATO would like to see the first start production of the Mystere 4 as soon as possible, because of the performance gain over the Mystere 2. This decision is still up in the air.

► Technology—Assembly factors at the Morane plant have the standard pipe-line outlay developed by the Germans during World War II. On the U. S. Republic Aviation Corp. purchased this system—Aviation West Inc. in 1941, p. 273.

With such a system, simplicity of job and layout is easily achieved, because the parts are like those of an Erector set. They can be set up quickly, knocked down, shipped to other factories and be set up again in minimum time. Changes from one kind of airplane geometry to another can be made quickly and cheaply.

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# Small Business



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# helps do a Big Job

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THE FACT that thousands of small businesses play a very big part in Pratt & Whitney Aircraft's production is far from accidental.

Some 27 years ago, when Pratt & Whitney Aircraft itself was a small business, its founders established the principle that approximately half of the work load should be borne by outside companies. Over the years this has meant that thousands of companies all over the U. S. have joined the ranks of its regular suppliers.

Now it has reached a point where there are over 5,000 subcontractors and suppliers furnishing parts, materials and supplies necessary for the building of Pratt & Whitney engines. Significantly, 50 percent of these suppliers—4,500 out of 5,000—are "small" businesses, firms with less than 500 workers.

Achieving production on such a broad base is something that could only be found in America. It is a typical example of how big business contributes its organizational ability, its engineering resources, and its know-how to make it possible for smaller businesses by the hundreds to share in major production assignments.

All Americans benefit by this type of teamwork. The task of providing equipment for the armed forces is not confined to a few big suppliers. Instead, large prime contractors like Pratt & Whitney, who alone have the resources to develop major items of military equipment, generate enough production assignments to keep thousands of medium and small sized companies busy helping to stock the nation's arsenal.

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Dussault uses a focus of optical imaging. Alignment of end points at wingtips or fuselage extremities is made on a ground plane target. This target is part of a box assembly set into the floor. Levelness flows the reference beam onto a grid laid out on ground glass. Adjustment is precise and quick.

► **Line Set-Up.** The Merganser factory is laid out in the traditional assembly line. A row rack of Oxygens and the twin-engineered transport move towards the big dome at the apex and at the assembly plant.

Components are received at the sides and either stored on a balcony or fed into the assembly line.

Planes progress through functional tests—made with a variety of reproducible console-type checkers—in the flight test hangar located at the left of the assembly area. In the flight test hangar, the planes are weighed and given final checks, then trussed across the field to the flight line for flight tests and delivery.

► **Personnel.** Dussault says with as few as seven you can get a lot of personal observation and operation. "Standing there all up night give the feeling."

Dussault's has an extensive capable staff with lots of ideas. They have designed and developed the Mystere I to a point where it is comparable to the current production fighters of Russia and the United States, except that it isn't in full production yet.

They have a better feeling the Mystere I, at a stage where it could be put into production shortly. If this were done, it would be the French Air Force with a first-line fighter which would not be inferior to its contemporaries when it got into service.

Production of the Merganser factory could be turned off later would be brought in. "There is ample space to do this."

Dussault's total effort is small compared to American standards, but large on an absolute scale. "The company is building one of the best fighters in the world," a tribute to the design and engineering talent which Dussault has gathered around him. They have quickly grasped the best in modern techniques and adapted them to their own use.

The quality of their workmanship is not equalled by any other manufacturer of aircraft known to me. The quality appears to be on a par with the largest British firms.

Individual activity is high, even greater than that in the British plants I visited, and comparable to American workers at their best. Mixture is extremely high, and matches workers' pride in their product.

So the whole picture adds up to an impressive sight.

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## Space Meeting

- Stuttgart is site of astronautic congress.
- Radiation danger seen as a major hazard.

Stuttgart, Germany—Basic problems of astronautics were the general theme of the Third International Congress on Astronautics held here last month.

The 24 technical papers presented during the meeting ranged over a vast field, including the effects of cosmic activities on living matter, the calculation of spaceship orbits, high-frequency radio for space flight and the aerodynamic design of hypersonic rockets.

Many of these presentations were based on individual research and were considered indicative of the kind of work that could be accomplished in small societies with limited resources.

Business at Hand—The Congress, attended by about 50 representatives of various astronautical associations of the world, was divided into two parts.

Members of the International Astronautical Federation met the papers of the first session, during the meeting, 35 papers from 12 countries agreed the IAF constitution. The United States was represented by delegates from the American Rocket Society, Reaction Research Society, Royal Rocket Society, Defense Rocket Society and Chicago Rocket Society. The ARS has elected the voting member for the United States under the ruling which allows only one vote per country.

Dr. H. C. Schuchman, West Germany Minister of Transport, who opened the meeting, said that his country was in termites in the possibility of space flight and was a permanent member of the German Gesellschaft für Weltraumfahrt (German Society for Space Research).

Because of his past record, Schuchman said that Germany should keep in touch with modern progress and contribute wherever possible.

All the speakers at the opening now shared the many problems of astronautics, in which IAF members could work. They recognized the magnitude of the problems involved and felt that international cooperation was a necessity for achieving space flight.

Dr. Eugen Sänger, well-known rocket engineer and authority on hypersonic flight, was elected president of the IAF for the second year in succession. Andrew G. Bailey, of the American Rocket Society, and Dr. L. S. Shapovalov, of the British Interplanetary Society, were elected vice presidents.



PROPS FOR PRINCEPS: Dual and single configurations form Proton power.



PROPS FOR BRITANNIA: Large public type line bladders from Westons team.

## Turbine Power Turns These Props

Then changes of the engine case surface on the Saunders-Roe Princess flying boat (top) and the Bristol Britannia show the "torqueback" and "paddle" type propellers used to convert turbine power.

The Princess coupled Bristol Proteus turbojets in the forward and under nacelles are linked to the main load 36-ft aluminum slip counter-rotating torqueback-type props, each making up an eight-blade unit for harnessing the 7,000 hp of each dual

powerplant installation. The single Proteus engine in each outboard nacelle takes a de-bladed four-blade unit from the main director. When the Britannia takes higher power engines, turbos will be made to follow steel blades.

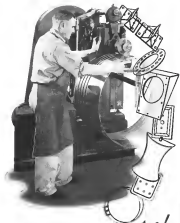
The 36-ft four-blade de-bladed paddle props on the Britannia have bellows steel blades, fed to the engine in Brims. Hooked to single Proteus turbojets, these units are designed to convert about 4,500 hp into thrust—more than the engine is now yielding.

During the session Dr. Sänger announced the creation of a chair of Astronautics at the University of Munich, Germany. (Ed Note: This is believed to be the first such university position.) Sänger told the Astronautics Week representatives that he had been offered the chair.

Technical Papers—The effects of cos-

mic radiation on the human body was considered in two papers, by Dr. H. J. Schuster of the U. S. Naval School of Aerospace Medicine and Prof. Dr. J. Engster, Swiss research worker.

They said primary cosmic radiation consists of atomic nuclei of extremely high energies, coming from outer space. When these hit atomic particles in the



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Forces (magnetism, further charged particles are produced and a cosmic ray shower occurs. With a very high energy particle (they can have energies up to 5,000 billion electronvolts) the shower produced can contain several million particles covering an area a mile or more in diameter at sea level.

The shower is composed of secondary particles, their distribution is well known since most of them occur in the lower atmosphere below about 70,000 ft. But the processes in air is well understood, and they present the major hazard—secondarys are not dangerous.

The Earth's magnetic field can deflect the protons as they approach from outer space, and only positively possessing cosmic energy levels can reach the atmosphere. Minimum energy required is about 6.5 billion electronvolts at the equator falling to about 1.1 billion e.v. at the poles. Thus we have no certain knowledge that protons with energies less than 1.1 billion e.v. exist in fact. It is these protons that may be important from a biological point of view if they exist in large numbers.

Thus have three possibilities:

- If there are no cosmoprotic low energy particles, space travel will be safe.

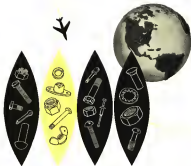
- If they do exist and are deflected by the magnetic field of Earth, then travel at a distance from the Earth will be safe. But how great the distance and how great the danger is at present undetermined.

- There is also the possibility that the sun has a magnetic field—though this is not yet known for certain—and so deflects some of the particles out of the solar system. Then the solar position of the system might be quite safe, and the outer portion quite dangerous as far as radiation is concerned.

► Design Details—Dr. Weisler with Boeing's paper dealt with some of the detail design problems of space stations rather than the broader aspects of overall design. Dr. von Braun, former V-2 development chief and now technical director of the U. S. Army Ordnance Missile Center, Redstone Arsenal, was unable to attend. His paper was read by Fred C. Danner, member of the AAS board of directors.

Spaceports need habitats, said von Braun, which might be in the form of cylindrical, air-lensing, spaceable containers. These could be risky similar to the space capsules currently specified for high-speed aircraft, and could be slowed down by air brakes and brought to Earth by parachutes.

Design supply for long trips also was read von Braun. Considerable previous study has gone into the subject, you can't consider protons of only hours or days. But the main problem for a spaceport, where the orbit might be



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used for materials, has received most attention.

A number of toxic materials are produced by the body, and might be dangerous if they accumulated over a period of months. The main problem in eliminating carbon dioxide, this might be solved with the use of the chemicals which absorb nitrogen, oxygen, and carbon dioxide.

Van Tassie also stated that books published since World War II on the general subject of astronautics had done more to advance space flight than those of the billion poured into military long range rockets.

Legal Problems—Some of the aspects

of astronautics law was considered by Dr. A. Meyer, of the Research Institute for Air Law at the University of Cologne. Dr. Meyer was of the opinion that two years, outside the Earth's atmosphere, would be considered as five years on Earth. The space traveler would not be bound by air law, but would be bound by a general legal obligation that he return and not endanger other traffic on planet.

Astronaut satellites could be built by any sovereign state, and would be received by the astronaut of the state that built them, said Dr. Meyer.

Delegations to the convention also attended a special astronautical exhibit at

the Stuttgart Museum held concurrently with the Congress. Much of the material on exhibit was rather elementary, but it represented a real effort to establish a solid foundation for a permanent collection.

## Douglas Builds Giant Static Test Setup

A static test structure that will weigh several million pounds is being completed by Douglas Aircraft Co. at Long Beach, Calif. It will cost \$150,000 and will be completed by 1950, 300,000 pounds of hydraulic equipment.

The overhead structure will rise at least 40 ft and afford a clear span of 52 ft. Foundation, encompassing 40 concrete piles capable of supporting a 10,000-lb. force, will carry a steel track with 4,500 drilled holes for attachment of hydraulic jacks and other test equipment. Jacks will be capable of exerting a force of 10,000 to 300,000 lb. in any direction.

## Jobs for Engineers

Employment opportunities for aeronautical engineers exist at the David Taylor Model Basin, Carderock, Md. There are vacancies in the aerodynamics laboratory in three categories: GS-5, GS-6, GS-7 per year; GS-8, GS-9, GS-10 per year; GS-11, GS-12, GS-13 per year.

The DTMB is a research and development facility which does a large portion of model tests on naval aircraft and missiles. The aerodynamics lab has two closed-circuit wind tunnels with 4-1/2 ft. test sections, three differential pressure wind tunnels with test sections 3-1/2 ft., 9-1/2 ft. and 16-1/2 ft. In addition, there is a 7-1/2 ft. impulse tunnel under construction.

Applicants should be forwarded to the Personnel Division, David Taylor Model Basin, Washington 25, D.C.

## Tool Men Form Research Group

Efforts to standardize and increase production knowledge and design shape in the form of a national, non-profit tool engineering research foundation. This project, sponsored by American Society of Tool Engineers, aimed to make use of industrial laboratories, colleges and universities for carrying out research.

ASTE already has appropriated \$75,000 as an initial contribution to meet the establishment of the foundation, and the trustees of the organization have been elected by the ASTE board of directors.

# Facts and Figures...

## Figures

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## PRODUCTION



**MACHINING** set up for all T40 shop components and tool cut for straight line, high-volume production. Left photo shows machining line for air inlet housing and diffuser, with rotation gear row one line of eight.



**ASSEMBLY** line (left) is for turbine compressor and turbine section building, leading to final section at right, with completed engine on dolly in foreground. From that point the turboprop is shifted to test cell.



## First U. S. Turboprop Assembly Line



**TEST** set up is typical of 30 cells used to check engine and propeller.

The first facility for production of the U. S. of turboprop engines has been set up at the Allison division of General Motors Corp., Indianapolis. Here, Allison's T40 is being pushed through its early production stages.

This engine, developed for the Navy, turns two Allison T56, driving a two-bladed, constant speed, constant speed propeller through a common reduction gear. Each power component has 19 compressor stages, four turbine stages. Rating of the T40 is 5,325 hp.

An area of more than 210,000 sq ft has been set aside at Allison Plant 5 for the production job. Tooling and other plant accommodations were started in July 1951 and completed last January. Since that time, trial report, methods determination and final phase production engineering studies have been made.

and the engine graduated into early production.

About 4,150 machine tools are involved in the production scheme. Units were obtained from Navy, Air Force, Defense Plant Corp., and Allison pools. Only 57 new machines were required. Many of the machines had to be overhauled and some modified for new uses.

The new facilities are set up in the same general area as those for Allison's J33 and J35. Most of the facilities can be used for all three engines.

Complex T40 components of engine section are set up on a straight-line production line. Items such as gears, shafts, casings and other intermediate parts are arranged in groups for maximum utilization of equipment and floor space. T40 peak production will require about 1,600 workers.

## Where Allison Makes Its T40 Engine . . .



**SMALL PARTS** were designed so that machining operations on a variety of parts can be accomplished economically in one line.



**HEAT TREAT** department at Allison plant was expanded to accommodate T40 production. Only a portion of the heat treat area is shown.



**DICHROMATING** section with automatic equipment to handle J33 and J35 casings now is being used for T40 production.

The propeller gear set, made by Allison, is part of an all-steel propeller gear set which usually operating at speeds of...

# 85000 RPM



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# Highlights

## OF THIS NEWEST FIBER GLASS OPERATION

**PLANT LOCATION**—Shelbyville, 27 miles Southeast of Indianapolis, is served by the Pennsylvania and New York Central railroads. The location presents numerous advantages to many users of Fiber Glass.

**PRODUCTION FACILITIES**—The most advanced manufacturing processes and techniques are being employed to insure the production of Fiber Glass which meets the most exacting standards and requirements.

**PRODUCTS**—Two basic forms of Fiber Glass, each in a full range of grades and sizes, are being produced.

**WEATHER INSULATION**—Composed of fibers of exceptional fineness—from 3 to 20/100,000 of an inch in diameter—providing greatest thermal and acoustical insulating efficiency—its weight, resin, extraordinary strength, compressibility and resiliency. In all standard grades and sizes, or fabricated to specifications.

**TAPE, STRANDS AND ROVING**—Continuous filament fiber, treated and sized to provide some of the weights and types required for electrical insulation and industrial and decorative fabrics. Roving, composed of continuous filament strands, handled in parallel, and chopped strands, consisting of roving cut to lengths of 1/2" to 2", for use in plastics.

**TECHNICAL ASSISTANCE**—A staff of trained engineers is available to lend technical assistance in utilizing PPG Fiber Glass to maximum advantage in all applications, particularly those involving new fabricating methods and products.

**RESEARCH AND DEVELOPMENT**—A program of continuing research and development is established for the purpose of giving users of PPG Fiber Glass every future advantage, from refinements in manufacturing to benefits in utilization.

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Products BETTER,  
SAFER, LIGHTER, STRONGER*

You may be able to realize important advantages in using PPG Fiber Glass. For additional information, please contact Pittsburgh Plate Glass Company, Fiber Glass Division, 632 Duquesne Way, Pittsburgh 22, Pa., or divide sales offices in Chicago, Detroit, New York, Washington, D.C., or the nearest PPG Warehouse.



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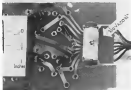
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## **SINCLAIR AIRCRAFT OILS**

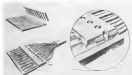
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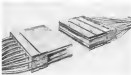
GE'S SMALL 18-conductor Novacon can be used...



TO CONNECT wire to printed circuits or other wires.



8 USE NOVACON 18-conductor elements like these...



ASSEMBLED underfactory into male or female connectors.

## Novel Connectors Aid Miniaturization

**Tiny GE Novacon units may remove the last obstacle to automatic-factory assembly of printed circuits.**

By Philip Klum

General Electric has applied patented connector techniques in a new field to come up with a new connector for printed circuit and subminiature receiver equipment. The connector should eliminate a major remaining hand labor operation, which has held back automatic factory-type production of printed-circuit assemblies.

The new device, called the Novacon, was first disclosed by GE's Warren D. Novak in a paper delivered at the recent National Electronics Conference in Chicago. Based on audience reaction, and the flurry of requests at the GE exhibit, the Novacon connector was only the first of the conference.

► **Variable:** The Novacon can be used to interconnect:  
 • Printed circuitry to printed circuitry

• Printed circuitry to conventional wiring.

• Conventional wiring to conventional wiring.

GE has designed one version of the new connector so it can be constructed in a variety of sizes, both male and female types, from one 18-conductor element. By stacking these basic elements, GE or a purchaser would be able to assemble any desired size of connector (up to several hundred circuits), Novak said.

All the metal (shell) and the Teflon parts in plug have been designed for push-in operations to make the new GE connector easy and suggestive to installation, according to Novak.

► **Basic Element:** The basic element is formed by loading an insulating cover plate in a large plate on which are printed 18 conductors. When used to

interconnect printed circuitry to wire, the connector is built in a third groove milled in the cover plate (see sketch above-bottom on left).

For wiring the wire to the basic element, a small slug of solder is placed in each of the 18 tiny vertical holes in the cover plate and melted either by soldering iron or selective heating. (The latter method is well suited to mass production techniques.) The molten solder slides through the hole to bond electrically and to anchor the wire to the printed conductor.

Although solder is notoriously weak in tensile strength, say pull on the wire and you'll see that the wire is pulled out of the solder, and in this it is considerably stronger.

► **Twenty-Gigawatt:** Novacon-A, 20-watt unit, is a wire-type connector constructed with two decks of 10 printed base elements as each of the male and female units. The connector is built up sandwich style and held together with a spring-loaded compression band. A strip of silicone rubber underlies the

Tons of Tank  
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It's the arm that carries the rear caterpillar track wheel of a tank. Failure would mean complete disablement—so soundness in the casting is a "must."

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Casts like this show why radiography is becoming routine in foundries even where it helps

earn a reputation for constant top-quality work—frequently suggests changes in operation that bring higher yields in production runs.

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NOVAKCON can function both as an electrical connector and as a mechanical support for multi-pointed contact assemblies like the one shown above.

Two 10-carat band elements in the female assembly also serves to exert contact pressure against the male assembly conductors.

A system of ridges and grooves in the compression bands secures the male and female units when mated. A small metal latch (shown in the photograph but not in the detail) firmly locks the two units. Thumb pressure against the latch will force it to permit separation of the two units.

Test Show Nagasaki—The 10-carat push-together design was subjected to over 1,500 mating cycles before a single conductor failure occurred. No voids and. He added that more than 12,500 cycles did no physical damage to the connector. If the units were designed with a manually operated device to exert contact pressure after mating (manipulation force), Novak predicted that the plug could withstand hundreds of thousands of cycles before failure.

When GTE conducted pull tests on the units, the solder ended held firm and the wire broke outside the terminal area in every case. Novak said. Single wires sustained 17 to 20 lb pull before breaking. GTE clipped the connector on a pull testing machine and tagged at all 10 wires simultaneously. The machine registered 175 to 200 lb before all conductors broke, again outside their local contact area.

On the basis of these tests, Novak concludes that the present method of wire-to-conductor termination will withstand any force which the wire itself can withstand.

• Electrical Characteristics—Novak said that tests on the basic 10-carat element showed:

• Contact resistance of about 0.01 ohms or less for conductors 16 to 24 mils over plating each other for a distance of 1 in.  
• Voltage breakdown occurs at 2,000 to

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- **Power parts and simpler design** make installation and inspection easy.
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- **Disposable in complete wiring harness or bulk assemblies.** Made by Monowatt to your specifications.

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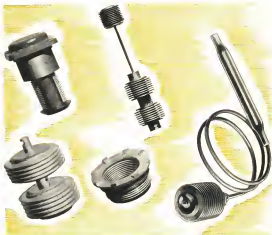
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**SIGNATURE** 15-conductor version of General Electric Novak.

1,800 v. at sea level, at about 700 v. at 50,000 ft. altitude.

• **Insulation resistance** is 100 megohms to 100,000 megohms at room temperature and humidity. This insulating feature is solely a function of base brass wire material and its insulation, Novak said.

• **Wear-Te-Proof Circuit**—When the Novak connector is used with a plated-circuit chassis, the chosen steel wires in the male connector with its spring leads pressed in a converging fan shape to align with the female contact conductors (see picture, p. 56).

When so used, slight dimensional variations of only a few ten-thousandths of an inch in the chosen Teflon or conductor plating could result in poor contact pressure between one or several sets of mating conductors. A slightly different design approach in the female connector shell is needed to solve this problem.

GE has worked on several solutions, Novak says. One is to attach a boy's inner copper spring in the female contact connector shell which is actuated by two small manually operated toggle levers when the connector is mated to the chassis. The spring deflects the chassis slightly to create a good contact pressure on all conductors.

• **Connector Mount**—For some applications, Novak thinks the Novak can be used in both a physical support and the electrical connector for small light weight pointed contact diameters. For computer and other equipment which are not arrays of electronic assemblies, the world wide possible applications in placement of fluidic circuits.

GE has made heretofore used transmitter version of its Novak by adding increasing sizes to small copper wires. These are in here, added to the long demand, and added off with a note. Novak said.

• **Smaller Units**—Not content with its miniature connector, GE has cooperatively made a subminiature 16-pin contact which is only 1 x 1 x 1 in using the same fundamental Novak connector technology. By using a two-disk construction with five conductors

## For Copter Maintenance



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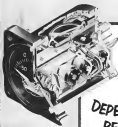
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# EDISON

## Temperature Indicators Selected for the New TWA "1049" Constellations



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**REASONS**

Category diagram showing the construction of a small, single and three temperature indicators for the new TWA "1049" Constellations. These indicators are selected for the choice because of their five exclusive features:



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Edison Indicators have no large stationary magnets so cause interference with the ship's compass or other equipment.

### 3. EXCELLENT RELIABILITY

There are no bearings and no delicate moving coils. The only moving part is a steel shaft carrying a dry magnet and pointer.

### 4. EASY TO READ

Temperature indicators have the pointer mounted in the center of the dial where readability counts most.

### 5. INTERCHANGEABLE PARTS

Parts between indicators of different ranges are interchangeable. Changing from one range to another is accomplished merely by switching resistors.

on each deck, Nevada, and that GE had built a 10-ohm resistor and only 1 in 10 is in use.

Future Plans—For the present, GE doesn't plan to complete a standard line of Navionics connectors. R. J. Biele of GE's Electromech Division told Aviation Week/World. GE will accept orders for units tailored to individual customers' needs until it feels enough about what sizes, shapes, and styles are most in demand.

Meanwhile GE has lots of ideas for applying the Navionics principle to connectors of other shapes, i.e., cylindrical, disk, etc., with a variety of clamps and compression devices. It will probably experiment with new and improved bent indicators to increase leadwire voltage and improve handling performance.

Inquiries about the Navionics may be directed to R. J. Biele, manager in charge of the components department, Electromech Division, General Electric Co., Skaneateles, N. Y.



## New Telereader for Oscillograph Films

Test data on oscillograph films can be read quickly and accurately with this new Telereader designed by Telecomputing Corp., company says. Device will project oscillograms onto viewing screen with magnification of 1X, 4X, or 16X as required. A single drive, accessible from a foot pedal, sets the oscillogram past the screen.

To read oscillogram, operator releases two handswitches to produce vertical and horizontal movement on oscillogram frame being read. Position of oscillogram can be read from the dials, or can be printed in decimal form on a typewriter or punched on cards, when computer is used.

Device will handle 16-mm. and 35-mm. film as well as film or paper oscillograms up to 12 in. wide and 100 ft. long. (Telecomputing Corp., 119 East Santa Anita Ave., Burbank, Calif.)

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PLANNING AND DESIGN, 1990, 10(1), 1-10

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*(A) signed under penalty of Perjury: Alexander G. Ross*

**FILTER CENTER**

► **Production at 700%—**"Production of military electronic items is now at 700 times times that at the outbreak of the Korean War, all but 5% of these items are of new and improved design," E. W. Engstrom, vice president of RCA's Electronics Division, told a luncheon audience at the recent National Electronics Conference in Chicago.

■ **Cutting Woregrade Weight—Boyer** Mfg. Co. of Bensenville has successfully fabricated an experimental S-band tube woregrade of aluminum, cutting its weight to 1/3 that of conventional tube woregrades. Aluminum has been used in small X-band and K-band "bleeders," but making larger S-band woregrades of aluminum has posed fabrication problems. Use of aluminum plumbing in an airborne S-band tube could save 30 lb, Boyer thinks.

► **New Storage Tube-Higher Aircraft** is reported to be developing a direct-view storage-type cathode ray tube, or reticon, similar to RCA's Graphicon. The new tube will presumably be used in a new Hughes intercepter for control systems.

► **New Thermistor**—A completely glass-encased high resistance thermistor with a  $-1\%$  per degree temperature coefficient at 0 dry. Catalogs are now available from Votary Engineering Corp. Reminders of the new type 71AL is 60 megohms at zero temperature; dropping to 3 megohms at 50C (Springfield Road Union, N.J.).

• **JH-25 to Use MH Control**—General Electric has reportedly ordered a Mitsubishi Heavy Industries turbocharger over-ride control for use with GE's JH-25 engine. The MH control will tie in with GE's integrated engine-capsure control system used with many of its powerplants.

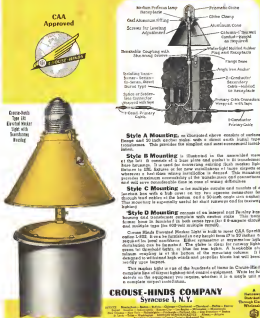
► **Trainer Gets Zero Reader—Evidence** of growing USAF acceptance of flight director-type instruments is the addition of Sperry's Zero Reader to Lusk Aviation's latest version of its C-11 basic jet flight trainer.

\*NEC Attendance Up—More than 6,000 persons attended the recent National Electronics Conference in Chicago, a 70% increase over last year's attendance. All 37 technical papers presented will be published by NEC in a volume which will be available after Jan. 15, 1951. It may be ordered from Karl Kromer, Proc. Secy., NEC, 652 East 53rd St., Chicago 19, Ill. Price: \$5.00.

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GRADUATION PLAYS HOST to three-day Teleds meeting where more than 100 aviation engineers gathered to hear . . .

## Plug Problems Analyzed by Conference

- Specialists at Champion meeting find that ignition systems become more reliable; but still see bugs.
- Agree on worth of analyzers; split on value of TCP, use of two different plugs in same engine.

By George L. Christian

Teleds—aviation spark plugs and ignition systems are becoming more reliable.

Spark plug life is lengthening—actual recorded miles of 400-600 hours are being successfully maintained by some owners. And at least two engines reported number of unscheduled plug removals as "negligible."

Ignition systems are generally becoming more trouble-free. (A few bugs have emerged in some Saab/Alfa Romeo units, but Scintilla reports it is quickly converting these malfunctions.) Increasing use of analyzers—Sperry's engine and Scintilla's ignition instruments—are helping engines and military aircraft operators detect ignition troubles and correct them before they become serious.

► **Wide interest**—that plugs and ignition systems still pose enough problems so that over 100 specialists were kept busy for three days at Champion's recent Spark Plug and Ignition Conference here. The specialists represented over 35 airlines—some 20 domestic and one foreign—USAF, Boeing, the Civil Aeronautics Administration, petroleum companies, and industries associated with the types discussed at the meetings.

The industry representatives came from the West (sixteen), Viper, Elmer Spark plug, cleaning machines, Sperry and Scintilla (each), Pack-

ard Electric, Revere, and Teflon Ignition materials and tests, and Pratt & Whitney Aircraft, Wright Aero, Westinghouse, General Electric and Allison (engine).

Airline representatives to the Teleds conference came from such distant corners as Argentine Airlines, South African Airways and Philippine Air Lines.

► **Highlights**—Here are some of the things the audience heard.

• **Eastern Air Lines**, unhappy about splitting and "bonnet perking" of Champion's KTS-1 plug's center electrodes, is testing approximately 15 sets of AL-7-171 plug in all engine compartments, except DC-3 powerplants. Test should be completed by December. F. W. Ludwig, EAL's general manager, engine supervisor, told the meeting the AL-7171 "was comparable to the K-775-1, without trouble," so far. But the carrier is having trouble getting delivery on AL-7's plugs.

• **TCP debate**—divided with divergence of opinions concerning the merits of the in-flight testing instrument (thermal plug tester). "Not bad that no one of the P&W KTS-1000 engines plug testing had been cut 50%, thus increasing aircraft availability 10-15%," American Airlines has completed one test evaluation of TCP, and will shortly start another. Northwest Airlines abandoned a Boeing Stratocruiser (Bort 740) for the reason of being overplugged, some hot trouble.

• **Temperature differential** between front and rear pistons spark plugs (and between front and rear now cylinders at the KTS-1000 engine) brought repeated demands from Chicago & Southern's superintendent of engineering, H. L. "Doc" Anderson, that Pratt & Whitney Aircraft do something to better the situation.

• **Use of two different plugs** in the same engine was condemned by some airlines having such an installation. Two different plugs are used by most KTS-1000 engines because of temperature differences between front and rear pistons.

• **P&W** and they had observed (on analyzers) as many as 15-16 plugs cutting out simultaneously at takeoff power. The condition was largely corrected by use of TCP in the last November.

• **Champion engineers** have released a L800F temperature rise in 30 seconds on plugs going from idle to maximum power conditions.

• **Number of power setting changes** is quoted as of an engine is an important factor in plug fouling, Champion found. Despite the fact, plugs had done during cruise settings.

• **Workability** of changing spark plugs seemed controversial. Cost and complexity of machinery and facilities in some operators, who favored the idea of having a full-engineer plug and servicing it. Other operators (and the USAF) wanted to clean plugs. Most of these do not discriminate between new and used plugs when re-stuffing them in engines.

• **Viper Blast Manufacturing Co.** accepted as a processing source of plug cleaning machines. Champion's cleaning methods were praised by the airlines using them. Packard Electric is



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## Spark Plug Fouling Details

Spark Plug Fouling and Pre-Ignition Characteristics of Aircraft Engine Corrosion-Preventive Compounds

Type of Test	Treated Materials		
	Aircraft Engine Oil MIL-C-56082	No-Frost Oil Non-Metallic Type MIL-C-5611 (HART) MIL-C-5611	No-Frost Oil Metallic Type MIL-C-5611 A/V-F-C-276
Spark Plug Fouling (Hours)	10 (at None)	10 (at None)	10 (at None)
Pre-Ignition (Hours) (2)			
Chalkboard (Air piston start deposit) (5)	2.5	4.5	5
Corrosion Protection Handling Cylinders (Hours) (2)	5	400	40
Hydro-Sulfuric Acid (Hours) (2)	Fail	Pass	Fail

(a) Average of four tests in 7 two-cycle engines.  
(b) Average of eight tests in 2 two-cycle engines.  
(c) Four cylinders. Conventional test requires six 15-minute pre-ignition periods (500 R.P.M. drop equivalent to nine pre-ignitions).  
(d) Cold firing system. Rating of 10 is perfect, 0 is bad.  
(e) Average of 20 pistons. Specification test requires 145 and 202 hours with polished pistons.  
(A/V-F-C-276 only requires 150 hours on steel blended pistons).  
Source: Gulf Oil Corp.

deterring results, was introduced to the conference. Products are the Ticonderga Processors Co., 9 S. Clinton St., Chicago 5, Ill. Spec numbers of the group is C5175A.

AC has changed to a pre-type design and says it gets better results.

• **Vapor Blast—A New Vapor Blast plug cleaning machine incorporates these features:**

• **High and low pressure blasts on the plug.**  
• **Automatic indexing**, to position the plug correctly for each cleaning operation.

• **Automatically rotating table** so that cleaning pin engages on all sides of the plug.

• **Average cleaning time of 3 to 10 seconds per plug.**

After cleaning, plugs are rinsed to clean off residue.

Vapor Blast was given the same test to clean up with an improved cleaning machine to be worked out in cooperation with Champion. The company will add these features to the existing piece of equipment.

• **Capably and features** to process two plugs simultaneously.

• **Prescribed delivery of slurry** to gear.

Additional pieces to be developed, probably as auxiliary equipment, will be power spray gun, air blowoff, various abrasives (including new ones) and pre-bleed chemical additives to the slurry to improve cleaning action.

Vapor Blast showed the conference preliminary drawings of a machine that

would clean better in many plugs as the Champion job and which was tentatively priced at \$900.

A spokesman from Kelly AFB, "the world's largest air depot," said Kelly cleans 25,000 to 30,000 plugs a day on three shifts. Daily savings were estimated at \$70,000.

• **Worth It—Ray Farrow of Trans-Canada Air Lines** pointed out the 344 engine. In plug cleaning, he said, worth it by the time you consider all the added handling needed for cleaning and put the labor and machinery required by the cleaning process, he doubts it.

Farrow says TCA uses its 13 Lodgy plug 506 hours in Merlin engines and throws them away, with good economic justification by installing only new plugs, not get replacement of performance.

KLM Royal Dutch Airlines continues its own system—re-pipping, not cleaning, of spark plugs. The carrier does not use a plug for more than two years—equivalent to about 1,500 hours.

Associated aircraft engineers, Paul Korte, gave this account of his company's experience with installing only new plugs in engines: On PW-6's, 100-hour maintenance, AA replaced one new plug (Champion) in the engine of a 17 now DC-68s and changed three over 200 hours. But maintenance personnel noted that these 17 aircraft replaced in such frequent trouble as the standard TAC-10 and General 240s.

AA resorted to pulling plugs at 400 hours and using reconditioned ones.

Wiley World Airlines said that plugs used in its B250 engines have the low cut unaccelerated removal rate, the engine was new and overhauled plug economically. United and Air France also do not discriminate between new and overhauled plugs.

The Air Force suggested that as the B-36 only new plugs are used because with accelerated plug rejection rate is extremely high.

• **Booth Testing—TCA** stated that it found results of standard bench test were completely at variance with actual results of plugs operating in an engine. Possible reason for the discrepancy is lost or loose test machine debris or debris from heat in engine.

Air Force suggested that such tests could be used and realistic results obtained by eliminating bench testing and using aircraft to judge plug performance after installation in the engine.

An associate of Pratt & Whitney said that his company has used heated bomb tests successfully. But if, although bomb tests do tell the condition of the plug, they are not equivalent to an engine check. But hot bomb testing is a long and tedious procedure, a detriment to its use.

## Plug Fouling

TCA's Farrow pointed out that there are different types of plug fouling. For instance, RQVC and TCA fly over the same routes with the same types of aircraft but experience different types of plug fouling. He suggested that the variable would be engine operating standards, particularly different fuel/air ratios.

Champion said the number of power changes as engine is subjected to is an important criterion in plug fouling. Deposits are laid down mainly during engine power conditions. And great temperature variations—1,000 deg. rise in 30 seconds can occur as plug runs away under an application of 100% power.

Champion listed these temperatures recorded on a thermocouple plug operating on a two-cycle cylinder:

- **Idle plug temp—1300°**
  - **Thermocouple plug temp—1050°**
  - **Non-thermocouple plug temp—540°**
- The temperature drop on a non-firing plug is due to large heat sink coming from the other side of cylinder instead of originating on the plug nose.

## Fuels, Additives & Lubricants

Gulf Oil Corp. representatives talked of their company's development of new aviation anti-icing engine oils, which do not contribute to plug fouling. GM type of anti-precipitate oils,



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used on AN/VV-C-355 network, contained merdite addition which helped meet plug loading.

Call measured results of its tests comparing the new type of oil with the old 574 type.

Engine analysis are projected may be longer by the new oil.

Preparation is not projected by new oil.

Plugging procedures are not affected by the new oil.

Plugs operate three times as long as new oil as on the 574 material.

A 30-hour accelerated service test on three oil-standard aircraft engine oil (MIL-D-5805) tested oil, one synthetic type (MIL-C-6539 (USAF), MIL-C-7551) and another oil, metallic type (AN/VV-C-574) was only showed that the new oil did not cause pre-ignition, whereas the old type did in 35 hours, but that it produced an "engine that was somewhat cleaner."

TCP Test—Great interest was shown in Shell Oil Co.'s anti-lubric additive, trisphenyl phosphite (American Weekly Sept. 25, p. 40).

American announced that its first test with TCP showed no significant improvement in spark plug service life. The test was conducted for 1,400 hours on two DC-6s using 92 thrust addition of TCP. But, as American pointed out, the plug service life on its —6s was already very low, and it was using relatively rich mixtures. The carrier stated that it was going to run a second test using 91 instead of 92 thrust mix.

Here are some undesirable features American attributed to using 62 theory TCP mix.

Carbon deposits shared on one-third of the exhaust valves on TCP engines.

Heavy deposits were found on exhaust valve heads and seats and on the back part of ground plug electrodes.

Norfolk Airlines had a TCP evaluation program going on its 10 Boeing Stearman, but, in 150 hours of operation on TCP fuel, NWA flight crews noticed considerable increase in exhaust back pressure. Cause was soon found to be deposits clogging the turbochargers, mainly because the use of TCP was immediately discontinued. Cause of deposits was led to high temperatures at this point in the exhaust system.

Shell said the restriction found on American's exhaust valves might be led to high temperatures, since neither USAF B-100s nor Navy B-280s indicated carbon deposits (apparently Shell believes that American is spending its engine at higher temperatures than the military).

Other TCP highlights.

TWA is running a test on all four engines of four Model 640 Cessna coach aircraft. Four identical planes are be-

ing run without TCP fuel in a control TCP aircraft have accumulated 11,000 engine hours, control ships 11,000. No significant difference in spark plug operation has been apparent to date, according to TWA. Usual scheduled removal rate of TCP plugs is 2.8 per 1,000 hours. Corresponding rate for non-TCP plugs is 2.6.

FairWA stated that TCP is effective in eliminating plug fouling. In its tests it found that without TCP, as many as 15-16 plugs would go out in total power. With TCP, maximum number to go out was three, a fact to which FairWA attaches significance. American confirmed this by saying that its DC-6

flight engines had without TCP virtually eliminated plug removal due to fouling.

On 500 plugs removed from Navy P-4s, none with TCP, none had deposits. On non-TCP plugs removed from other P-4s, "many had deposits." D. H. Hens, Shell senior engineer, stated that spark plugs removed, but looking from 10-15 had been replaced by 70-90%. On Navy B-280 engines, he estimated the figure to be close to 90%, while on military helicopters the replacement stands at 50-75%.

The RCAR is testing TCP on its Mustang, but so results are available. KLM is testing TCP on a Cessna

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Here shows the Pesco piston-driven fuel pump as installed in the fuselage of a new jet airplane.



Another Pesco product that is standard equipment on the new Mainliner Convair is the mainline hydraulic pump, located in the nose wheel of the airplane.



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methods of applying cement.  
**• Phase II:** Use new method of firing glass and... Plugs with this improvement will be available in November.  
**• Phase III:** Substitute S12 alloy or laminated in order electrode material.  
 Champion indicates that the R358 plug is being service-tested by P&W/A in use in all positions of the R2300 engine. In engines expected over 1000 hours the plug would do well, especially when Phases II and III are incorporated.

Many airlines are using Champion R315 plugs in new positions of the R2300 engine and find it satisfactory. The plug causes backfiring when used in all positions of the engine. But Eastern said it was too complicated to use two different plugs in one engine.

On the other hand, GAI, which specifies in which cylinder to use the R315 (2-4-6-14-16-18), says it has no problem having the correct plug installed in the correct position. But Eastern wants better identification of plugs.

TWA is having trouble with R315-1 ground electrode fracturing.

Eastern indicated that it expects successful operation of the AC 171 plug. Tests should be complete by the end of the year.

**• Fine or Messier-Roche:** Fine speaks out and that they found very little difference in performance of Fine's and Messier-Roche spark plugs. KLM and go on to discuss plugs tested in close with one. The carrier is using fuel with 4.6 and 4.7 cc. per shot fuel content. TWA and they had experienced bridging of fine wire about and were going from a 025 to a 016 in. gap.

Silent said in actual test it was better off using AC 171 spark plug than Messier-Roche units as in aircraft being in the Belgium Congo.

United and Western Airlines have been conducting tests to determine if 15-day spark advance has any detrimental effect on R2300 engine. Both airlines claim that spark advance had no measurable effect on engine performance. Both airlines attribute to spark advance was set at 14°.

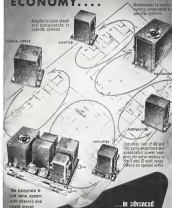
Late of the R315-1 in the average Convair 240 certification is 574 hours for low turbine systems and 564 hours for high turbine, according to Champion.

**• AC Plug:** Eastern is testing AC plug in its Convair engines (R119C1-1). No results are available. Eastern air is comparable to the R315. But, these (1) more cost on the AC plug.

Air Force says unscheduled removal rate of AC plug is 2.3 per 1,000 hours.

For American indicates that the main problem with the AC 171 plug is ground electrode erosion. In general

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...facts Magazine. He states, in sum-  
...mary, "A concise, easy-to-read...  
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plug on its 32,830psi involved a 1 lb weight increase per engine.

#### Research & Development

Spark plugs with 10,000-hour operation have inspired interest into Champion does not know of a single case of weather failure that would in any way detract from the high-40 years of experience. Problem is to obtain complete stability to ensure does not open up and keep plug from doing.

Rate of temperature rise, constant heat treatment is undergoing, according to Champion.

Means have been developed to ensure the temperature of the plug and the resistance of another simultaneously. An eight-chamber control system has been developed. One of the chambers will be used for torque meter readings.

The Ethyl Corp. representative said his company is working hard to develop new unleaded and unleaded.

"Barker Cap Spark Plugs," developed by Ronald Barker, are no longer under test by P&WA. Although the Barker tests were impressive, P&WA was unable to substantiate them and discontinued testing the plugs.

Yokota Plugs—J. Yokota and P&WA had tested 60 different types of the Boeing version plug. They were unable to demonstrate that it had better firing characteristics than existing plugs. It is not interchangeable with other plugs because it requires about 5 deg. greater spark advance than conventional plugs to obtain same results.

It will work in certain applications but is not versatile enough to function well under a wide range of applications. The plug is hard to pop out of the head.

Capital reported of the Main spark plug it had tested that it had no specific engine use. Capital and the plug was long to them, and had no advantage in testing characteristics over conventional plugs, as they were discontinued.

#### Magnetores, Leads & Harnesses

Scientific low-friction ignition system components are in the process of being developed. One feature was a second circuit by the diode which is considered best period (100 msec) may change in the solution. Other problems were caused only, difficulty in setting up the machine.

PAA also experiences can follow suit.

At Force and the mag needs adjusting, too often, sometimes at intervals as low as 10 hours. Some units were returned three times per engine change.

Three degree timing shift is sometimes allowable, say the experts. P&WA

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spread that their R490 engine could tolerate such a drift.

As a temporary expedient, UAL is lubricating the mag with two bags of SAE 50 oil every 100 hours.

El C. Webb, Scottdale's chief field engineer, said his company was working hard on these problems. He pointed out that high temperatures of the mag increased rate of wear but was appreciable wear between armature-bearing point pitting, which could not be tolerated. He added that future rate of wear could be much lower than present rate. And replacements are being supplied free of charge.

To correct magnet bearing retainer loosening, Scottdale has tightened up on slack fit of the bearing bearing in the housing, screws are to be retightened. A new ball bearing may eliminate problems of top bearing bearing in the housing.

Distributor loosening are still causing despite being up, as a new fit is being considered.

Collector plate-distributor brush problems on the R2600 engine are very minor, according to Scottdale. Some operators have much trouble, others none.

Scottdale's advice: Drive engine, keep going pressure on the brushes, to avoid brush chatter, avoid "inspiration" if the system system of an engine is running right, tune it alone.

Lead-tin-silicon quaternary leads require careful handling, being never susceptible to damage due to moisture. They also fail in breakage when heat to spark plug terminals, but no spark. Distribution trouble. They are easy to reuse, and stand up well to heat, the composite lead. P&WA is using silicone leads exclusively on jet engines with considerable success.

## Analysts

Use of analyzers, both the Scottdale engine and battery engine units, is expanding.

Analysts are using temporary type life, to allow mechanics to look up an engine and use the engine for a collection of the plane where they can read its scope in condition. The analyzer wants a modification which would put a reference number on the analyzer scope.

Factors in using its aircraft for ground use of the analyzer-like first step to using the unit as an engine reference.

P&WA is happy with its analyzer instruments, and that its mechanics found a series of good magnetic laboratory by means of analyzers.

United is embarking on an analyzer program.

TWA, speaking of Scottdale's exclusive source-hand control—indicated that its

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► **Casualty Officer**—The Chicagoan conference was headed up by Brian Moss, special assistant representative, who arranged all details of the meeting. The meetings themselves were able provided by six chairmen: A. B. Holman, Scandinavian Airlines System; M. C. Filkins, Sabena; R. L. Anderson, Chicago & Southern; L. F. Larson, Northwest; F. W. Lockman, Eastern; and S. P. Kovic, Aeromexico.

### NEW AVIATION PRODUCTS



### Rocket Test Aid Measures Pressures

A transmitter actually attached for measuring pressure conditions in an aircraft pressure system under flight test has been placed in the suitable alloy aluminum by Consolidated Engineering Co.

The unit, whose output can be read on a micrograph, is so small to indicate pressure changes on water weight 9 oz. with cable and plug. Consolidated claims its transmitter is suitable for a wide range of pressure conditions, measuring anything from violent surges and high-frequency pulsations in static or slowly varying pressures. Both gaseous and liquid systems can be tested or monitored with the arrangement through a wide temperature range, the company claims.

Pressure models are the low pressure variety, but later versions will be designed for rocket propulsion testing on air high pressure and extreme fuel conditions. Output of the unit is said to be known within 0.5% of full scale. In operation, fluid or gas flowing into the unit changes the displacement of a cylinder in proportion to pressure variations. This expansion is convertible changes, in fact the position of water weight around the cylinder. The water counteracts the action of a piston and bridge-coupled relays in become performance in low pressure change and can be fed to meters and other indicator or measuring equipment.

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The unit can be used for remote operation of shut-down mechanisms in aircraft. Motor, rated at 5.5 hp, transmits shaft automatically as determined by limit switches. Backstop is provided by an air brake which allows shaft a minimum of 10 turns before holding. Output is rated at 13 lb. with shaft turning at the rate of 2,000 rpm, according to firm. Units can be built for use in d.c. operation. The entire assembly weighs 54 lb.

Thales Air, Inc., Redwood, Calif.

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See-Gel, a new type of film, may help air shapings. A mixture of a new resin, organic white compound and nitro, its burning point is controlled by the porosity of the mixture. It produces no water run-off on melting and releases approximately 10% oxygen when exposed to heat and is non-toxic and non-flammable. It may be screened and used. Chrysler & Fibre Associates, Oakland, Calif.



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## AIR TRANSPORT

### Switch to Coach May Alter Plane Design

- DC-6, Connie unsuitable for five-abreast seating.
- Ticket-credit plans may be offered passengers.

By Lee Moore

Airlines and manufacturers are discussing the switch this month that the whole air transport industry will change from 81% first-class to over 50% coach within a very few years. This will affect everything from the physical shape and layout of future transports to the technique of passenger sales presentation.

The significant shift to coach is being accelerated by the major airlines at the recent Civil Aeronautics Board hearings on how to prevent crowded airway aircraft service from competing with scheduled lines. Virtually all the big carriers reported each other as they took the stand, one by one, and an assumed soft coach expansion plan Eastern may make a similar announcement soon in Miami, where the hearings resumed this week after two months in Washington.

• **Swedish Segregation**—The switch to coach affects the manufacturers as well as the airlines.  
• **Market design**. To the manufacturers at some acceleration of the new transport designs on first-classing boards. Even in all published reports must be laid out for quick and cheap conversion to high-density seating. The airlines, the airlines are going directly into the fact that the DC-6 and Constellation layouts were not planned for five-abreast seating, nor for any of the other peculiarities of high-density seating and aircraft as "transport" aircraft.

The Connie is set in the middle but, by itself, so that five-abreast seating is available in the middle section only. The DC-6 does not take, but is a little less roomy all the way to make five-abreast seating comfortable for the fourth passenger. The conversion affects not only width of the fuselage but the shape and flexibility of almost every fuselage—hanger necks, cargo bins, galley layouts.

• **Passenger Airlines**, for instance, nearly the Douglas DC-8 jet transport readily convertible to five-abreast seating to make it economical on shorter hauls of less than about 1,200 mi. Parking

Domestic Scheduled Airlines				
Year	All services (Cents)	Coach None None	Total \$171 121	Coach None None
1947	4.4	4.4	4.4	4.4
1948	4.2	4.2	4.2	4.2
1949	4.2	4.2	4.2	4.2
1950	4.2	4.2	4.2	4.2
1951	4.2	4.2	4.2	4.2
1952	4.2	4.2	4.2	4.2
1953	4.2	4.2	4.2	4.2
1954	4.2	4.2	4.2	4.2
1955	4.2	4.2	4.2	4.2
1956	4.2	4.2	4.2	4.2
1957	4.2	4.2	4.2	4.2
1958	4.2	4.2	4.2	4.2
1959	4.2	4.2	4.2	4.2
1960	4.2	4.2	4.2	4.2
1961	4.2	4.2	4.2	4.2
1962	4.2	4.2	4.2	4.2
1963	4.2	4.2	4.2	4.2
1964	4.2	4.2	4.2	4.2
1965	4.2	4.2	4.2	4.2
1966	4.2	4.2	4.2	4.2
1967	4.2	4.2	4.2	4.2
1968	4.2	4.2	4.2	4.2
1969	4.2	4.2	4.2	4.2
1970	4.2	4.2	4.2	4.2

\* First service did not start until Nov. 4, 1948.

† Data compiled courtesy of American Wings from Air Transport Ass. and CAB.

in a fifth row of seats automatically cuts out not just available passenger but about 20%.

• **New sales techniques**. To the air, the airlines' capacity expansion comes also a rapid shift into more casual sales practices.

The director of the CAB Bureau of Air Operation, Gordon Bates, says the next step may be airline use of computer credit financing plans and advertising similar to the "buy now and pay later" types long used to push sales of insurance policies. In order to compete for the consumer's limited supply of spare dollars, the airlines may have to make use of the same techniques.

American now says that the cost of converting 90% of which is now travel by auto—offer the airlines their biggest field for expansion. To win this market from car to air the airlines say also how to provide first-class service at the destination of a plane something like the new National Airlines is pioneering in Florida. Bates believes.

• **Coach Development**. The scheduled domestic airlines' coach business is up 70% over a year ago. Load factors are so high it's still difficult to get a new vehicle.

• **From World Airlines**—presently the leader in aircraft expansion—predicts that by 1960 aircraft volume will be bigger than total airline passenger volume today. First's new TWA crashed that conclusion. CAA predicts 14 billion domestic passenger miles by 1960. TWA boards that to 20 billion. Air Transport Ass. predicts this year's total domestic passenger volume at 11 billion. Second TWA believes coach will cut into most standard volume, the

coach business by 1960 will be bigger than today's total business.

• **Premium Service**—The heavy airline service now called "standard" will not wither away. AA and others have said at the recent CAB hearings that they will add more plush to that service, even before they get to transports to offer the premium service, the airlines will be offering more and more "extra" as heavy service to serve the traveler who has the extra cash to spend making his trip more comfortable and pleasant. Airlines will experiment with better food, more, bigger bedding, more modicum, massage and telephone service.

• **Short Haul Discount**—The short-haul air service is a third type. It has at least the airline's high-density seating and flexible without need service. But you can't call it coach because the fare is high.

From the customer's point of view, short-haul is not a new coach. That is because he can go by train cheaper and almost as fast on many routes. Short-haul rates can't be made much cheaper in some areas because seat costs are still high. The top length grows shorter. Weekend and holiday, including camp service, and ramp time as all such that domestic short-haul continues.

• **However**, some reduction of short-haul air rates will be possible if airlines use flexible seating arrangements, as they are now being urged to by Consolidated Vultee Aircraft Co. maker of the new Convair 440 jet which the airlines have over 100 on order. Also, as long-haul coach grows, some airlines like Capital, TWA and United are already making extra-ordinary steps in some route-upgrading

operator of short-haul coach service on long-haul routes. This is an argument for TWA and United. American says it won't pay with its same routes, but TWA is instinctively prepared to agree that.

■ **New Rate Structure**—Thus, the airline fare and revenue picture is growing into three distinct patterns. First, coach (and first-class) fares are the growing long- and medium-haul service at 4 to 44 cents a mile. Next there is the "tailored" long- and medium-haul luxury service at about 6 cents a mile. Finally, there is the expensive short-haul service at about 64 cents a mile (7 cents a mile including lounge service). Short-haul air service will come into its own eventually with advent of jet helicopters at the end of this decade.

However, airlines are not ordering coach planes direct from the manufacturer yet. Only Pan American is known to have ordered a coach fleet that year. The others may follow eventually. Meanwhile, most of those planes are in old plants to coach lines and give their passengers far outworn the newest and finest planes. It is too soon to tell in detail how the coach development will eventually affect maintenance.

■ **TWA's Air Fares**—Coach service is steadily expanded so that it will amount to an estimated \$90 to \$100 million of this year's predicted \$425-million domestic revenue.

The airlines used to have a single rate per mile regardless of distance. Now they are going to a "segment" fare structure—high on the short haul, low on the long haul. The 40 fare increase on all airline tickets this spring further accelerated that trend. That's the way most coach fares and the industry is now sold on the theory that fares should taper with cost.

The trend will increase automatically as coach becomes the main means of travel over long and medium distances between cities. This CAB review of the air fare structure will be a shrewd one. But the outlook is that rates won't change much unless costs do. "Don't rock the boat now," the airlines repeat solemnly, trying to get CAB to drop the fare investigation.

The airlines point out that fares are already much lower than bus fares. Finally fare and coach service will account for 30% of transcontinental passenger revenue this year, and eventually for 40 to 45 percent, ATA predicts. The 5% roundtrip discount also cuts the fare below bus fares.

■ **Individual Coach Plans**—Hunt are further recent developments of so-called "tailored" coach plans and policies revealed at the CAB hearing—in addition to those buried in AVIATION

WEEK Oct. 28, p. 37 and Oct. 27, p. 17.

■ **TWA** is a few years, TWA believes, coach passengers will both domestically and internationally will avoid "standard." It has already done this on the trans-Atlantic, trans-mountain and into California routes. Sales Vice President E. O. Cooke said at the CAB hearing: "We're developing by experience plans announced before TWA's at the hearings." "Our coach is not yet the standard carrier will be able to take care of the market."

TWA therefore has proposed that CAB put the "standard" delays out of the account, but now that the scheduled airlines are ready to serve the demand adequately themselves. Cooke proposed that the numbers be restricted to special charter only—both private and government charters. And TWA proposed that even that CAB authorization for that type service be "temporary."

Asked in cross-examination by the unrepresented witness attorney, Alvin Karp, if these TWA recommendations would not in impair the "back seat" model that they could set public financing Cooke answered: "I don't know."

The official attorney asked his last with that answer. While CAB may want to restrict scheduled operations, it has not yet killed them off. "Standard" transcontinental, coast-to-coast, and domestic, scheduled, has gained 50% over a year ago. But military contracts plus erosion of CAB

restrictive regulations have eroded for the. Actually, CAB is giving the upper hand and is expected to allow scheduled coach operations more and more.

TWA's seat sales next year will be 1.2 million coach and 3 million first-class, Cooke predicts. Coach load factor will be 75% and first-class about 73%. Internationally, 30% of the new carrier's trans-Atlantic service by TWA was coach, next year it will be 40%, an 1974 60%, and eventually 85%, Cooke stated at the CAB hearings.

■ **United Air Lines** United will send a study within a few months and decide how to convert up to 17 DC-6 type planes to coach seating. These are preliminary conversion-cost alternatives furnished United by its engineering department.

DC-6 with 70 passenger seats \$51,000 78 seats \$58,000, 81 seats \$58,000.

DC-6B with 78 passenger seats \$55,000 85 seats \$58,000, and 89 seats \$41,000.

United also has studied coach possibilities of its 50 Boeing 707s but has not yet decided on any seating change. The DC-7 seating arrangement is still open, as Douglas has not started production yet.

United said it will invest \$143,000 in flight equipment from 1953 through 1955.

Decided more skeptical of the economy of coach, a new even experimenting along with TWA on medium-haul coach. American says scheduled coach is not economical, as the service is already high density.

■ **American** has just converted to a 70-passenger DC-6 coach as a compromise between the "Atlantic standard" of comfortable service as balanced against the economic need of high density seating to boost the fare. New American plans 80-passenger coaches. Of the 10 extra seats, one will go to the forward cargo bin and the tenth goes as all part of the center aisle, removing passage at that point.

American already carries more coach than first-class passengers transcontinentally—will almost double coach capacity by next spring, with a total of two 80-seat DC-6s operating.

■ **National** NAL has been a consistent advocate of the daylight coach—had to fight over for CAB acceptance. Short of equipment for its winter season right now, National's coach service is an addition. "That means National is using all its DC-4s and DC-6s in coach and first-class in demand and schedule circumstances permit. NAL needs its DC-4s from 51 to 69 seats by using Douglas convertible seats. The 4 DC-3s, 5 DC-6Bs and 8 Convair on order will allow National more coach service.

■ **Capital** Capital's James W. Austin,

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continent to the present, and he believes Capital has spent more money on aircraft development than any other company—\$300,000. And Capital has a tough time competing with United, American, TWA and Eastern for 75% of its business, he adds. There are no pipelines and fewer roads here than Capital's home land, which has been built since 1944-1950, 1955-1958, 1959-1960, and 1961-1962. But, even though Capital has lost 15 to 16% Capital sales only eight aircraft carrier because of its congested shipping, but will replace the eight each with DC-4's each carrier sales is five additional. Conclusions are from KLM for first class.

• **Northwest.** Assistant Secretary C. L. Stewart says that in August, 40% of Northwest's domestic revenue passenger miles were coast. And next summer the line will add "at least six" more Northwest DC-4's.

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## Silver City Completes Year on 'Minor Airlift'

(McGraw-Hill World News)

London—Silver City Airways, an independent freight operator, last month completed its first year hauling blockaded exports from Berlin to Hamburg in a "minor airlift." In 1958 round trip cargo first cost Berlin 178 and this month the line has approximately 900,000 revenue ton-miles carrying 5,500 long tons or 11,213,000 lb of freight.

On work all types on the 160 mi between Tempelhof and Hamburg, the daylight cargo movements loads at more than 10,000 lb, usually delivered except direct items, such as process machines. The contract calls only for transportation of freight out of Berlin but frequently a backlog is caused on one occasion that congested some for a West Berlin relief.

## Mexico Steps Up Airport Facilities

(McGraw-Hill World News)

Mexico City—A new \$3 million airport terminal is going up at Puerto Marques adjacent to the recent town of Acapulco on the Pacific Coast. Reason for the construction is an increasing amount of passenger traffic into the port—handling over 175,000 yearly. Other airport construction and modernization work is being pushed in Mexico. New fields are being built at Nogales, Hermosillo and La Osa, and a new passenger airport and runway are being put in at San Luis Potosi Airport. Late this year a new passenger terminal will be placed in use at Mexico City's Central Airport.

Research Director Alonso Aguilar, a new airfield field at Santa Lucia, 10 miles north of Mexico City.

## British Outline Plans To Expand Gatwick

(McGraw-Hill World News)

London—Details of a large-scale development of Gatwick Airport to augment ground facilities for handling the increasing air traffic in the London area, expected to double by 1960, have been announced by the Ministry of Civil Aviation. Present expansion of London Airport shows a major air terminal is thought inadequate to meet future demands.

Plans for Gatwick call for construction of two main parallel runways, each 7,000 ft long, 150 ft wide, 3,200 ft apart, the first to be completed by 1956. A third runway 5,000 ft long and 150 ft wide is planned for 1958. A passenger terminal and maintenance area also are planned.

Some objections to Gatwick as a major terminal are that it is 27 mi from the center of London, making it difficult to arrange the airport a high to be well-served by water, and its proximity to London Airport might confuse air traffic.

Advantages include shortening of the route to the Continent with a more direct saving of fuel it would be cheaper to enlarge an airfield closer to the city than build a major new airport.

## Iron Service

Recent British Overseas Airways Corp. moves in Tehran indicate that the carrier plans to convert its weekly service to the Iranian capital. BOAC Chairman Sir Miles Thomas has been quoted as saying that the airline plans to increase its plane years from Tehran.

## Dedicate Heliport

Los Angeles—A prediction that 25-40 passenger helicopters as big as a DC-3 will be carrying mail and passengers in the Los Angeles area within five years was voiced by Igor Sikorsky at the dedication of the new John M. Donahoe Heliport atop the U. S. Post Office Federal Annex here.

The dedication, coinciding with the 50th anniversary of the Los Angeles Army airport mail service, was also the occasion for a plea by LAA President Clarence Gibson for central legislation and organizing, engineering, maintenance and better ground facilities to speed nationwide civilian use of rotary-wing craft.

GAA Administrator Horace Bryant said general versatility and all-weather operations, among the work he was under way to meet possible mail transportation by heliport and to develop necessary ground work.

During the dedication LAA's 51st anniversary they should mail service with one of the carrier's new 515s on the road for days. Carriers now have made more than 100,000 landings and takeoffs of mail than 15 million pounds of mail on the Post Office roof.

## Italians Lack Research Funds

(McGraw-Hill World News)

Rome—Although there has been a noticeable improvement in the production phase of the Italian aircraft industry because of NATO contracts there exists a real need for housing research and development so that major progress will be brought about in overall progress, a study report compiled by an Italian Ministry committee of inquiry which has investigated the industry.

The report concludes that the government should attempt to have some NATO funds assigned to push Italian experimental work to make up for the lag in the field.

It is also noted that the industry's production potential is both positive and enough constant to bring it up to the standard set back before World War II. Only 4,000 workers are now engaged in aircraft.

The committee recommended that 37 firms could be used in building as follows: four in manufacturing instruments and 28 in making instruments,

accessories and other equipment. Twenty-one of the plants are located in northern Italy, 16 in the central section and 10 in the south and in the islands. Present plans call for increasing the aviation industry in southern Italy.

## New Agreement Set On Service to Africa

(McGraw-Hill World News)

Saharan, S. Rhodes—Agreement has been reached on a new pattern for air services between Great Britain and southern Africa by British Airways, British Overseas Airways Corp. and South African Airways involving the use of a new aircraft, the general manager of GAA R. G. McGee. The agreement contained recent approval of the agreement before details of the new service can be decided.

The agreement was worked out at a recent International Air Transport Union conference in Geneva.

It is planned that British Airways is to play an increasing role as the airlines between the United Kingdom and southern Africa.

## Map in Cabin Shows Location of Plane

(McGraw-Hill World News)

London—A device designed to show air passengers precisely where they are at any given moment while in flight is being developed by the English firm. It is an automatic screen map for aircraft cabins. Controlled from the automatic Decca Navigator in the flight deck, the screen, measuring 21 in. by 16 in., shows the plane's position by means of a dot of light moving across a screen of transparent screen maps.

The Decca Navigator has been adopted by British Overseas Airways and will go into service first on the Viscount technology. But the screen map for passengers is not yet in production.

## Copters Speed Mapping Project

The past summer two helicopters equipped 7,700 sq mi of Canadian territory west of Hudson Bay, carrying maps as schedule maps. Officials estimate it would have taken a ground party 25 years to handle the same task.

The task, cost \$214,000 or approximately \$1.10 per square mile. The project required 900 sq mi a day and 1,180 landings were made during the survey to permit geologists to get a first-hand look at certain geological features.



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## The Complexity Problem-II

(The chief project engineer at the Royal Canadian Air Force Central Experimental & Proving Establishment at Ottawa has released these general news in *Aircraft News*. They also appear in the current issue of the RCAF publication, *The Observer*, under the title, "In Fighter Design as a Pilot." During the last war, the author flew fighters with the RAF and RCAF in Egypt, Malta, Sicily and Italy. After the war, he received his Master of Science degree at the University of Michigan. His subsequent comments will be concluded on this page next week.—R.H.W.)

By Wing Commander A. E. Houde, DFC

There is a strong tendency nowadays to design aircraft and to include additional equipment for the sole purpose of cutting down production losses. The engineer knows that the public will hold it in its pocket but will accept anything in time of war.

The engineer is a technician. The public will accept facts. The additional equipment is put there to protect pilots. The performance of the aircraft suffers, and too much noise, more consumption and radio-wave time are lost in combat for every man-made who is used during the war.

How often do operational requirements personnel and design engineers discuss the cost as an aircraft's performance—and therefore the added radio-wave time to the possible extra factors that added equipment will give?

Packaged and designer point out that some engines and other controls cut down on pilot fatigue. Through this it is true in general, a fighter pilot in a cockpit could not sit down even if he were able to stretch out in an air chair. He is often forced to get very hard and uncomfortable if ground living is the cockpit is going to long hours, "usual" for head material of addition to the number of his life. Therefore, when the added equipment will result in an all-around saving—how it is.

Once an aircraft is built it is difficult to calculate the effect of an additional 10, or even 100 pounds of weight and the increase in its "fuel oil" but in Mr. E. H. Houde's view of Bendix products, he has pointed out. "The design of a combat new model of a 300th class of equipment is added, and the performance and strength are maintained, the gross weight is 100 pounds less than it was before, 10, or a total of 1,000 lb."

Then the weight added can result in an additional good result in the fact of the engine. The following paragraph outlines a few specific reasons which it is considered that there is considerable reason for repeated thought. They do not pretend to be exhaustive, but can, then, in all cases be legitimate criticism, but they are worth considering.

► **Engine Station—Engine stations for jets are contributing for two weeks to the weight of the aircraft. Even if the engine station was heavier, reliable, weight could be lost without station. We must consider the additional weight which would be added to the installation. Airborne stations result, add more than 100 lb. to the aircraft and no one need when the plane is on the ground. Doesn't this mean a bit ridiculous? Surely a little more thought could produce a method of engine station which could be fitted on the compressor and all the fuel. Another possibility is the use of compressed air. Possibly during long lines in a program, but the fact remains that**

our greatest fighters have been built with the old two station.

Then can only be attributed to laziness or to indifference in the outfit at those who fly our fighters in a possible next war. It is to be hoped that the problems and cost of replacing such stations at all bases is not used as an excuse. Such an excuse would be equally absurd in any type of sport, from football and (yes is now) all of the cost per ton of carrying extra weight through the air, the cost of percent gained and air station, and the added cost of the structural materials which must be built into the aircraft components to maintain strength and performance.

► **Radio Navigation Aids—Used though they are in peace time to aid us in finding our point to point, our next enemy war, not just, but provide radio beacons over the horizon in time of war. He can, indeed, not even show us his own way. There is a strong possibility that fighter in future line war will be completely directed by ground radio. Possibly, the weight of a radio compass in a fighter is preferred, but its use in future should be restricted (by a self check) to be broken if necessary) in order to prevent plain to navigation without its help. Other navigational aids must never even come into consideration.**

► **Automatic Temperature Control—This cockpit feature will the extension of temperature gauges on an already full instrument panel, indicate how often it is to be kept into a constant state in far as emergency equipment is concerned. Though not much may be added in terms of weight, this is made more complicated both for the pilot and the increasing costs. Is automatic temperature control necessary at all? Does the Air Force select pilots who don't know when they are hot or cold so who are unable to open a simple window valve? Does a pilot care what the cockpit temperature is as long as he is neither too hot nor too cold? The optimum temperature will vary according to the amount of flying clothes the pilot wears, his physical condition, and the amount of exertion he puts forth, so that he will have to adjust for himself anyway. Let us remember the gallons and weight!**

► **Emergency Units—More and more emergency or dual units are being added. Rapid component replacement can tell the weight of units to a point at which their reliability is improved and a second one must be installed on a very-fewer emergency. One specific case is the constant fuel pump and regulator installed on some jet aircraft. It would be interesting to get statistics on the number of times it has actually been required in comparison with the accidents caused by such controls. Because it is considered when an aircraft makes it necessary to "go home again." All it really accomplishes—let's face it—is the addition of weight and increases complexity.**

► **Armament—Bombs and rocket motor design to keep pace with current performance, so does the weight of guns put keep on going up as the square of the base? Are we not making a fetish of gun fire and increasing time as evidenced by gun portages and forgetting all about weight? Put the size and weight down, even if guns only last for 1,000 rounds, and the aircraft that are used could be standing by almost refueled and rearmed for the next sortie. It is easier to put in new guns than to provide a new aircraft. Statistics on the average life of a fighter aircraft in front-line operations during the second World War would give us a clue as to which to use. The lowest and best gun in the world are no good unless the weaker attack has performance to match the enemy's. (To be concluded next week)**



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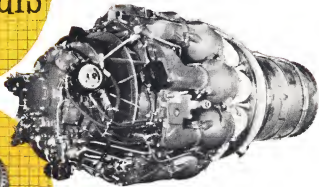
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